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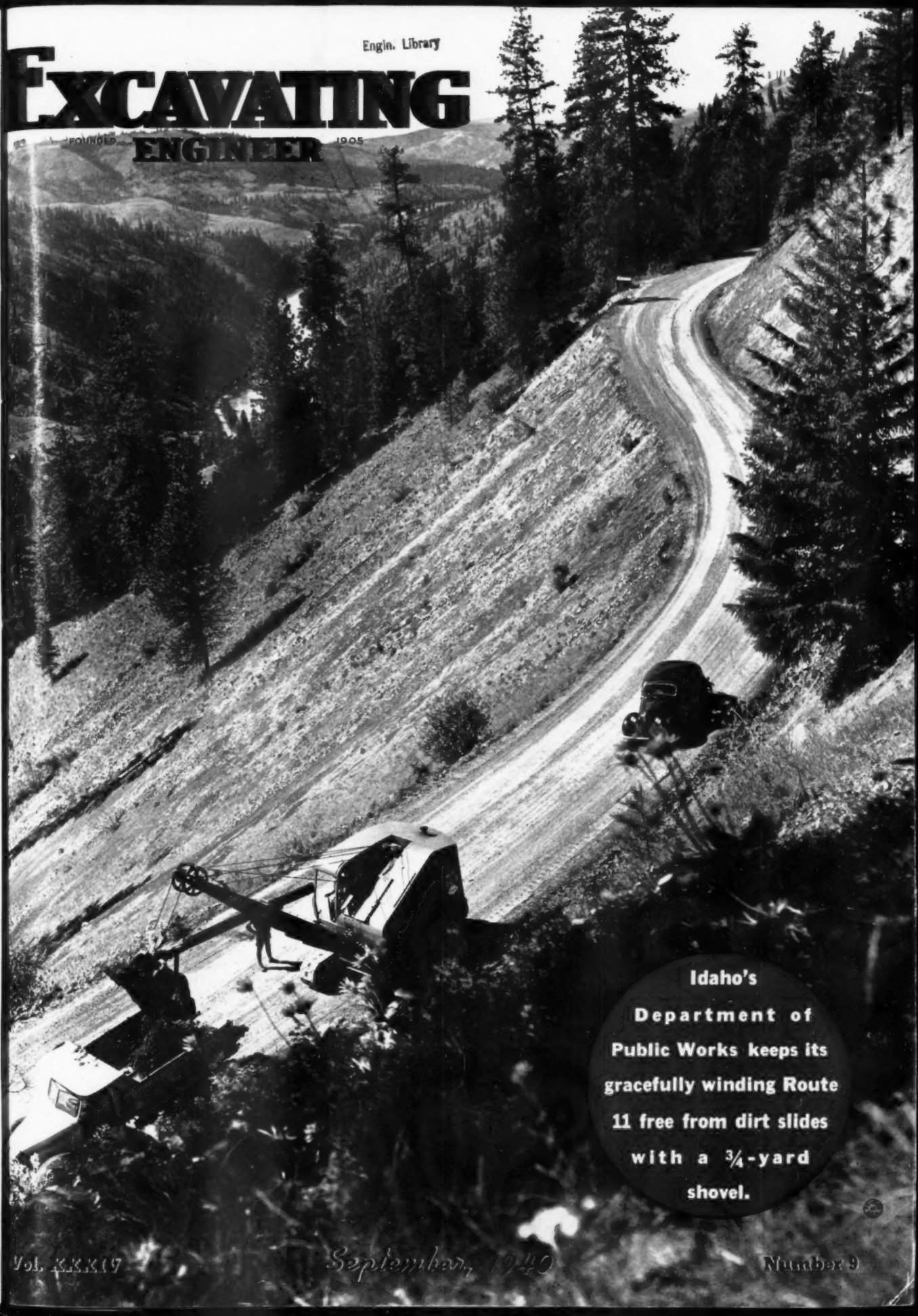
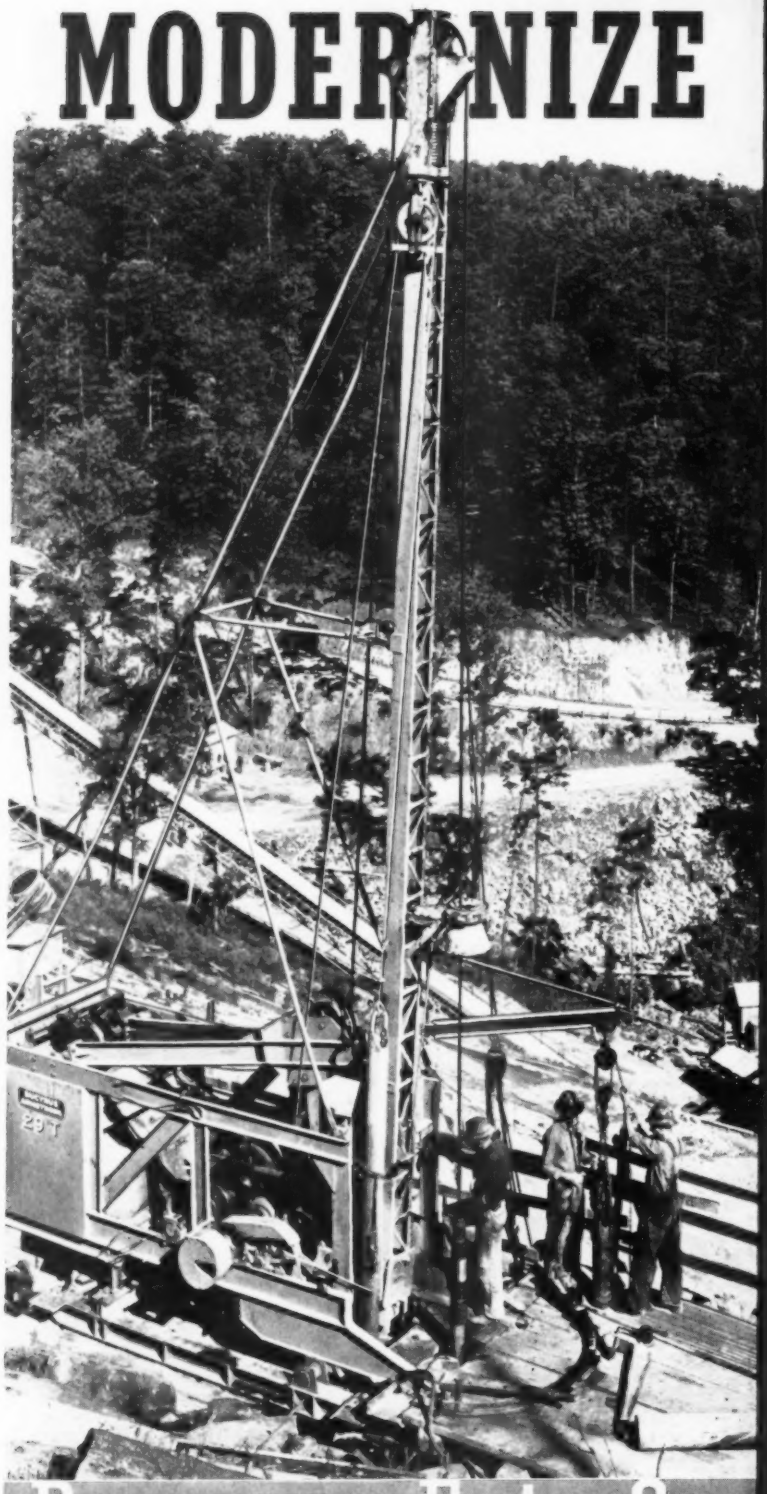


Idaho's Department of Public Works keeps its gracefully winding Route 11 free from dirt slides with a ¾-yard shovel.

Vol. XXXIV September, 1940 Number 9

MODERNIZE



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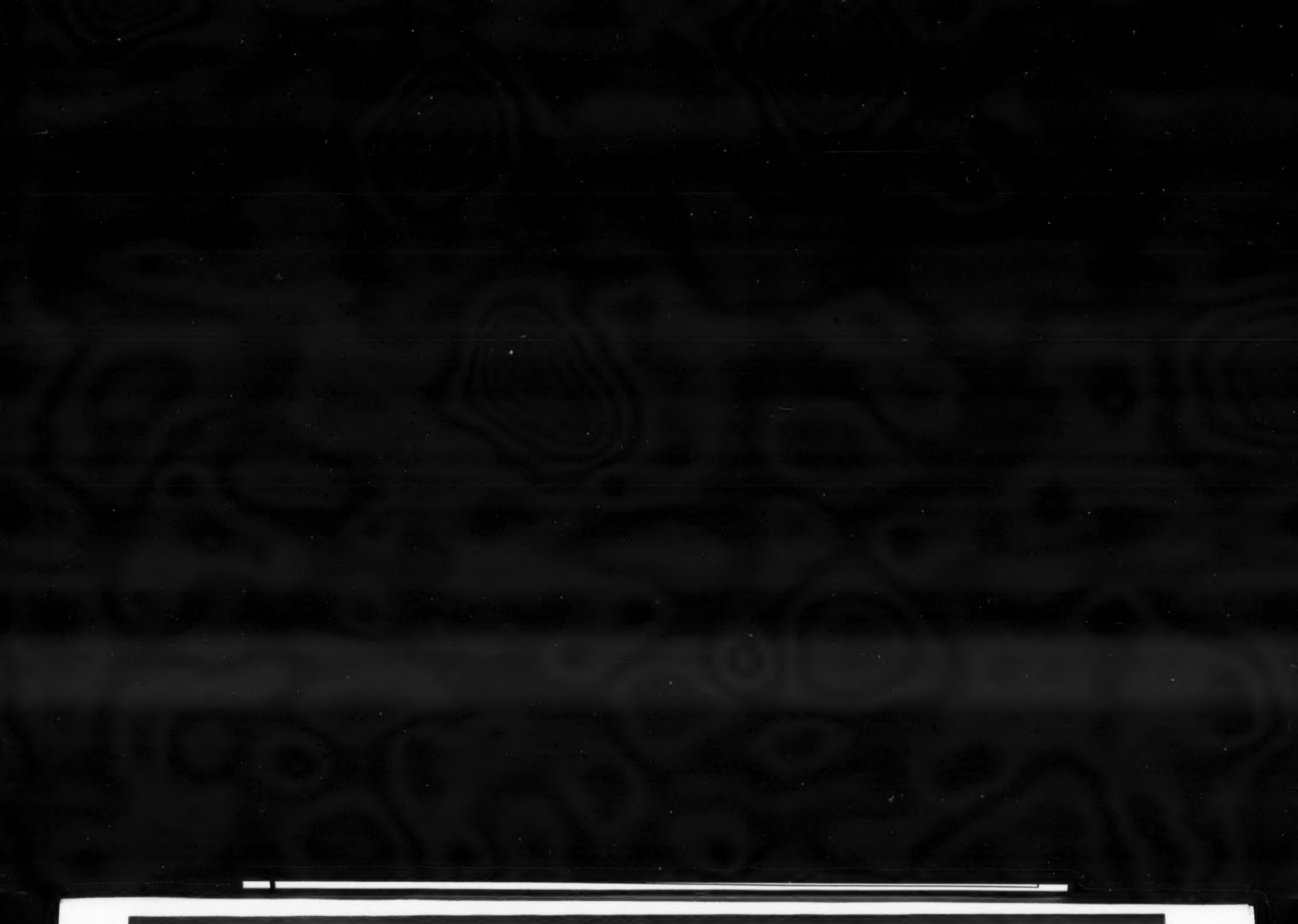

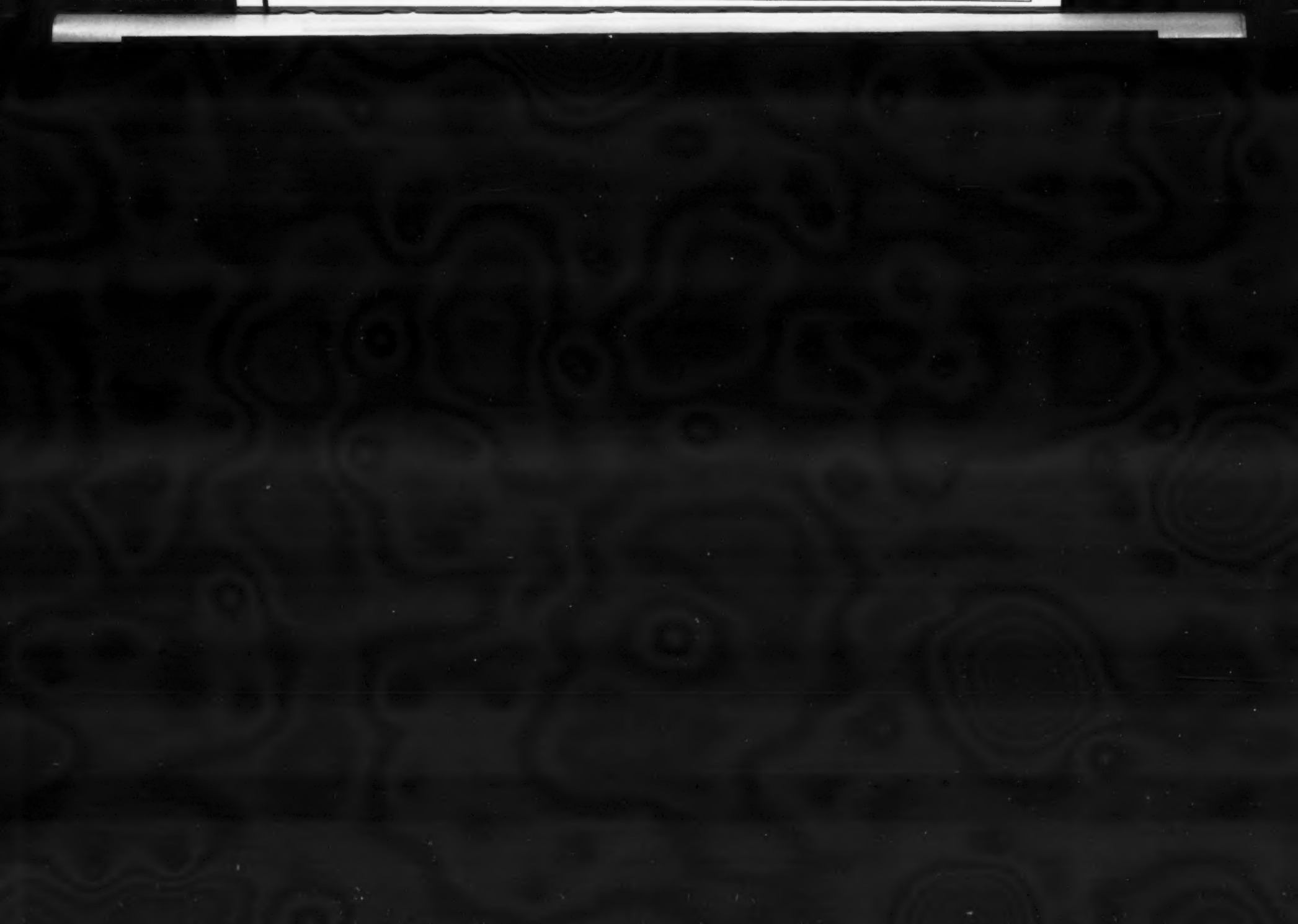

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EXCAVATING
ENGINEER
SEPTEMBER 1940

DAM WITH A

Hollywood ADDRESS

Plain John Doe as well as Gloria Glamour will welcome the completion of California's Sepulveda Dam which will end the yearly flood ravages of the upper Los Angeles river.

By FLOYD SUTER BIXBY

FAR BELOW and to your right as you climb the steps of Griffith Observatory in Los Angeles burn the glittering lights of a modern wonder-city. It is a metropolis of beautiful women, kleig lights, premieres, gay music and laughter. Splashed with twinkling color, moviedom's capitol lies etched in the twilight, pulsating with the tempo of fast living.

Events move swiftly here. Life is lived or dissipated with the speed of the neon lights which flash their messages across the high buildings of Hollywood's Radio City. To your lofty vantage point comes the rumble of distant traffic and the wail of an occasional siren. Everywhere are lights; red lights, white lights, and myriads of blue and purple and silver ones. Looking at the magnificence of the scene, you are struck at once with the self-sufficiency of it all.

"Here is Paradise," you are tempted to say. "Here is a peaceful Shangri-La contained entirely within itself, unmenaced by wars or famines or floods"

This, unfortunately, is not the truth. In this city of make believe, the joys are mixed with heartaches, genuine qualities are mixed with shams, and as her affluence is mixed with her leanness, so is her periodic rainy weather always a dread menace to her famous summer climate.

Flood Protection For Los Angeles

Out of the maze of writing material originating in this movie city comes perhaps the most realistic story of all. It is a tale of the successful struggle for flood protection by an army of hard, earthy men, who in recent years have built of steel and earth and concrete a bulwark of protection from disastrous floods. No longer are the metropolitan areas periled during rainstorms to the extent they were a few years ago. On all sides of the city the chain of dams and channels is nearing completion. In the valley of the Cahuengas, the engineers of the U. S. Army are forging another vital link with the construction of Sepulveda Dam, the dam with a North Hollywood address, and by June of 1941 the waters of the Los Angeles River will be safely tamed during the rainy season.

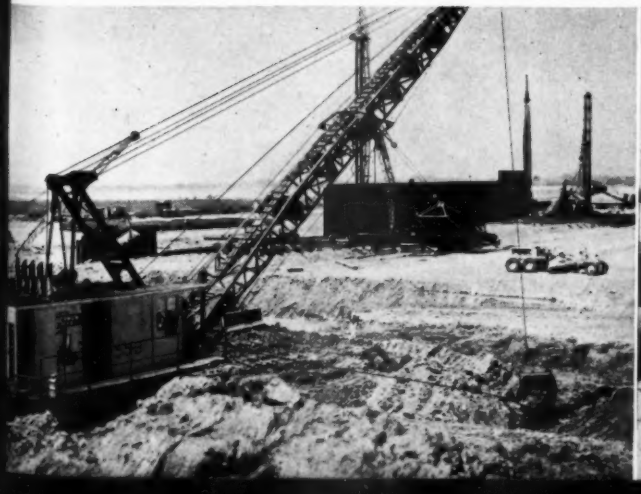
The need for flood control structures around Los Angeles grew rapidly within the past two decades from quite a simple cause. Mushrooming rapidly in its amazing growth, Los Angeles and its environs soon spread over the flat coastal area bordered on all sides by towering mountains. Building construction was undertaken without providing adequate drainage facilities for the expanded communities. By and by the flat coastal area was inhabited as far as the base of the mountains. A few venturesome and wealthy citizens, composed chiefly of movie stars, even built their homes in the mountain canyons.

In winter, rains coming in from the Pacific Ocean spent their fury against the mountainsides, throwing a torrent of water out across the coastal plain, flooding the communities and causing loss of life with untold property damage. Canyon homes were washed out and destroyed and others were engulfed in the wild and roily streams. A system of retarding reservoirs was designed to impound a large part of the rainstorms on the various rivers which flow into the Pacific ocean.

Several dams were built on the San Gabriel river, Hansen Dam is nearing completion across Big Tujunga Wash, Prado Dam is 75 per cent finished in the Santa Ana Valley, and studies are now under way for the construction of a dam across the lower San Gabriel and Rio Hondo Rivers.

Sepulveda Dam, the $3,121,000 structure designed to retard the

● Opposite Page: Leads and framework of the specially-built piledriver, Saratoga, are silhouetted against the evening sky. Below, left: A Bucyrus-Erie dragline casts its 3-yard bucket in the outlet structure excavation. Right: Fill material is loaded into one of the Euclid wagons by a Caterpillar elevating grader.



upper Los Angeles River, is being built under the supervision of the U. S. Engineers under contract with Sepulveda Constructors. This group of contractors is composed of the Jahn-Bressi-Bevanda Constructors, Inc., Joseph A. Dowling and David G. Gordon. Started on January 5, 1940, 540 calendar days have been assigned for the completion of the work.

Relocate North Outfall Sewer

Before the main body of the dam could be constructed it was necessary to relocate a section of railroad around the damsite, and some 15,000 linear feet of the North Outfall Sewer was also rerouted around a different location.

A contract was let for this work to Artukovitch Brothers of Los Angeles some months before actual construction was contemplated on the dam. Artukovitch Brothers, who are well known around southern California wherever sewer and underground work is undertaken, ran their part of the job out well ahead of schedule.

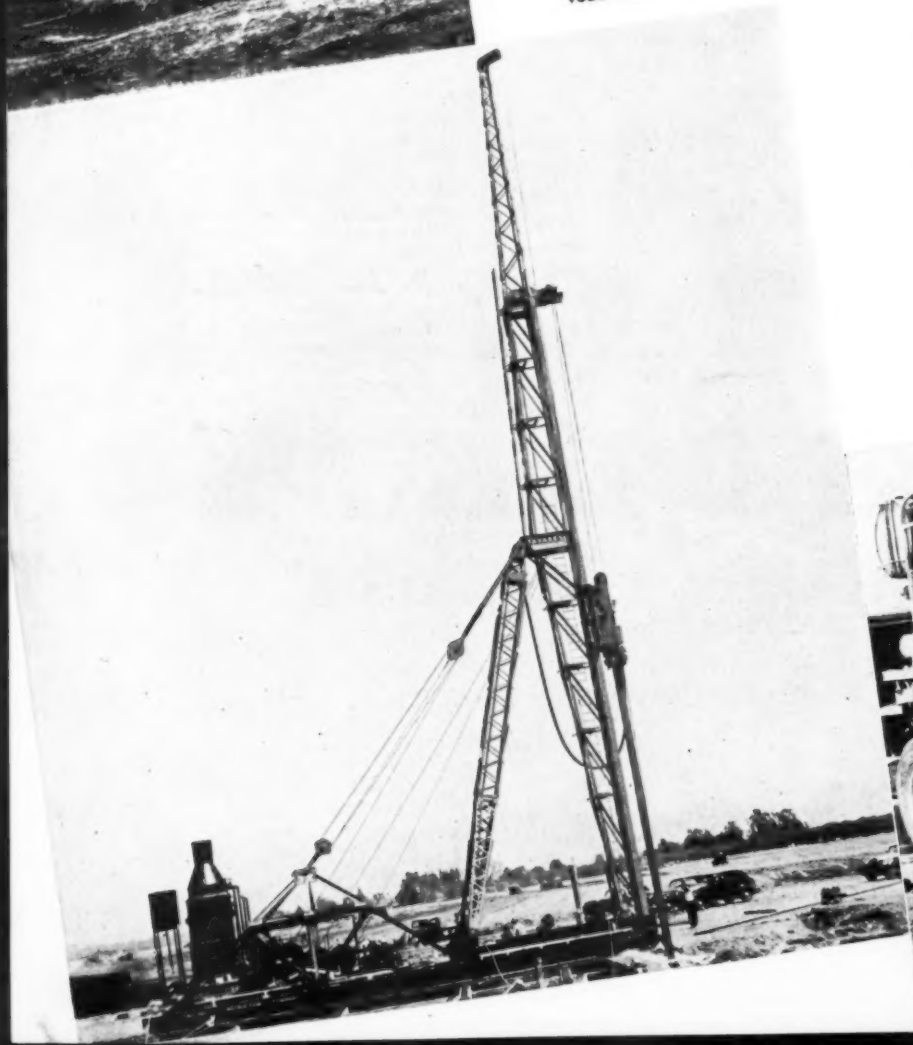
Specifications for the placed elevation of the 22-inch and 24-inch vitrified sewer pipe called for a ditch ranging from 29 to 38 feet in depth. To do the excavation work, a big Buckeye trench excavator was brought in. This is one of three such machines in the United States, according to the Artukovitch Brothers and with this unit the excavation work was completed in one operation. The Buckeye machine moved along on its cats, dragging an endless chain of buckets on the long boom drooping along behind the rig. In cross section, the excavated ditch was seven feet wide for 20 feet of its depth, narrowing down from that point to a four foot width for the remaining ten feet. As much as 300 feet of ditch was dug per 8-hour shift, involving the removal of 2,000 cubic yards of soil.

Operations along the sewer line followed each other in systematic order. As soon as the Buckeye machine had excavated the ditch, a bracing crew worked along behind it setting braces to conform with the laws of the State of California to prevent cave-ins. The ditch was dug for the most part through a deep silty loam soil, and it stood up well with the bracing required.

Working directly behind the bracing crew was a pipe placing gang. A model 206 P&H crane was used to pick up and lower into the ditch the joints of sewer pipe. The joints were set in place in the bottom of the trench with a speed which kept up with all the rest of the operations.

As soon as the pipe was set, and as a matter of fact at times while it was being set, a concrete

● General view of spillway construction operations on the Sepulveda Dam.



● Left: Overall view of the piledriver "Lexington." Two of these skid-mounted piledrivers were especially built by the Tavares Construction Company, for use on their sub-contract. Below: A fresh batch of concrete slides down the "elephant trunk."

crew came along to pour a concrete cradle around the pipe. This cradle was square in cross section, extending about six inches on the outside of the pipe. The concrete was poured with a 4-inch slump, and was worked into the pipe joints with a hand trowel. The concrete was hauled in three Jaeger transit mix trucks from a mixing plant a half mile away.

As soon as the concrete had set sufficiently, the trench backfill and the construction of manholes was started simultaneously. Earth was placed back in the trench in 10-foot lifts, each lift being thoroughly flooded and jetted with water from the city mains nearby. Although some little settlement of the finished work took place, the method was quite thorough, because in several places additional soil had to be hauled in to augment that taken from the ditch originally.

Manholes and house connections were located at intervals along the sewer line, and these were set up as fast as the work progressed. The bricklayer in charge of manhole construction usually worked directly behind the concrete gang. With two good helpers on top of the bank, this bricklayer set up an average of 2,500 bricks per 8-hour day. He was a Mexican by birth, and had been in the business since he was a small lad. It was no unusual sight to see him chewing on the end of a powerful cigar in silent wrath, swearing at his helpers and vowing that before the job was finished he'd complete one of the manholes in one shift by setting up the 5,000 bricks required to complete the job.

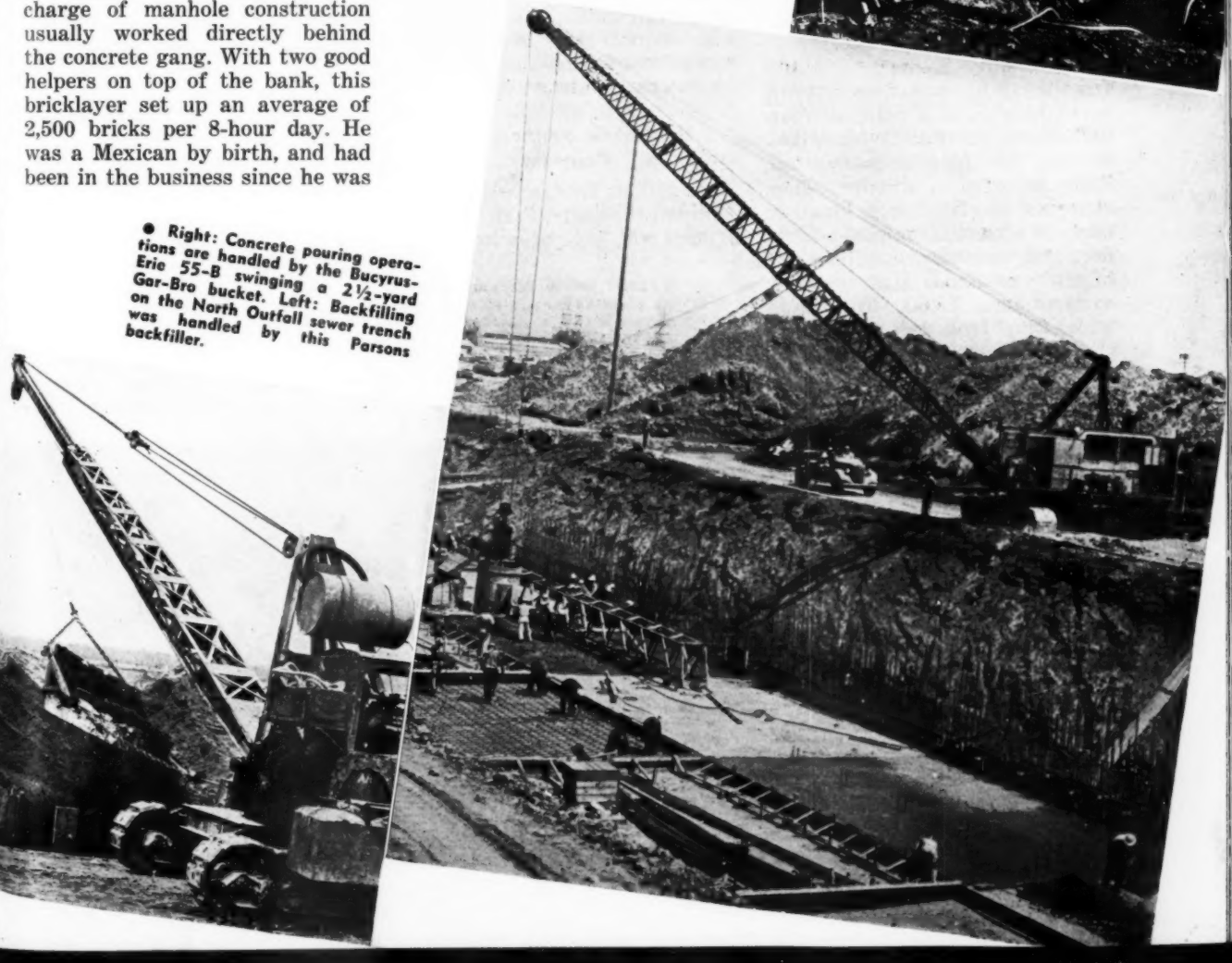
Backfill was done with a small Parsons backfiller, which managed to keep pace with the rest of the operations. The entire work: pipe laying, excavation, concreting, manhole construction and backfill was carried along in such a short sequence that the whole operations were seldom more than 500 feet in length. The relocation of the North Outfall Sewer was finished late in May, and most of the other existing structures on the damsite had also been removed at that time.

A large part of Mother Nature's sector of Sepulveda Dam is an extended earth embankment without abutments, stretching across a natural basin approximately 40 feet deep in the center. Composed of 2,500,000 cubic yards of compacted impervious material in a single zone, the embankment will stretch 15,500 feet across the valley when it is completed. Work on the embankment is now well under way.

In cross section the embankment varies in elevation from 2 to 50 feet, with a 3 on 1 slope on

(Continued on page 550)

● Mrs. Bill Pace, wife of the Tavares Construction Company's superintendent, christens the "Saratoga" with a bottle of champagne.



● Right: Concrete pouring operations are handled by the Bucyrus-Erie 55-B swinging a 2½-yard Gar-Bro bucket. Left: Backfilling on the North Outfall sewer trench was handled by this Parsons backfiller.

● Engaged in one of their daily conferences to plan the immediate objectives of men and machines are: (L to R) M. M. Jester, plant superintendent; H. R. Houchins; and Fred W. Heldenfels, superintendent of construction.

Soil - Cement

Heldenfels Brothers of Texas pla Kennedy County's first soil-cement stabilized base highway on a 34.6-mile contract

By BRIAN GUILBERT

DOUBLY IMPORTANT because of an entirely new type of road construction and the fact that this particular stretch of highway has figured in the news of the nation for over ten years, the construction and surfacing of 34.6 miles of highway in Kennedy County, Texas, by Heldenfels Brothers is attracting attention from engineers and laymen alike.

Traversing Kennedy County from north to south these narrow acres have been a political football, storm center and bone of contention for half a generation. They defeated a senator. They represent the last heroic stand of men and ideas that created a kingdom and wrested a livelihood out of the wastelands that are now southwestern Texas. The stand which they took was based upon the rights of eminent domain. But no one man, nor group of men, can long oppose the needs and encroachments of an advancing civilization. Today, despite many obstacles, political, economic and physical, the highway is in the process of construction. It is expected the work of building and surfacing this stretch of highway will be completed in November, 1940.

Early in 1941 this last connecting link in the famous "Hug-the-Coast" highway (U. S. 96) will be open to traffic. This link, alone, will shorten the now existing route from Kingsville to the Valley towns by almost forty miles.

Heldenfels Brothers Win Contract

Heldenfels Brothers, who were awarded the contract on their bid of $292,000, have been in the materials and contracting business since 1910. Fred W. Heldenfels, Sr. and his brother, C. A. Heldenfels, were formerly in the lumber and materials business. During World War I, they contracted for, and built, four vessels in their own yards at Rockport, Texas. These ships were built for the United States Government.

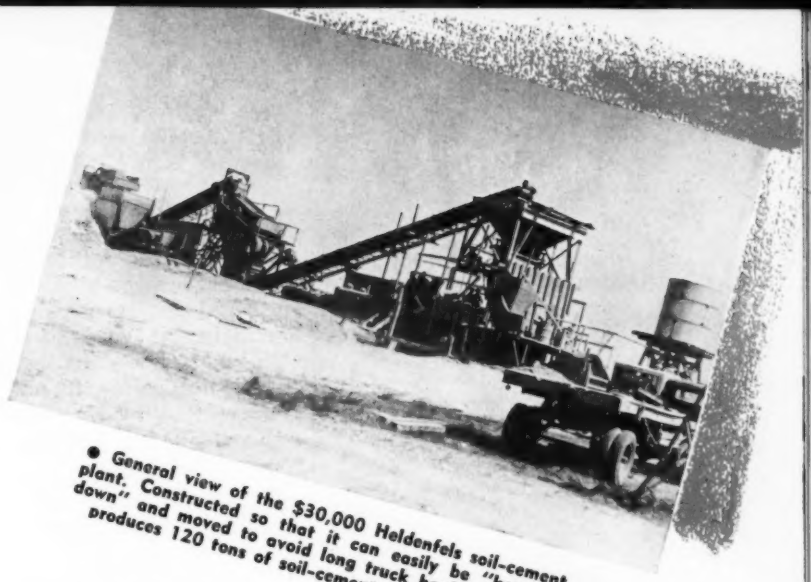
The brothers separated in 1922 and the business was carried on under the banner of Heldenfels Brothers, Fred W. Heldenfels, sole owner. Early in 1937 there was yet another internal change in the business. At this time it became Heldenfels Brothers, a partnership.

The three sons of Fred W. Heldenfels, Sr. are now assuming a portion of the responsibilities and are taking an active part in the management of the business.

Fred W. Heldenfels, Jr., graduated from Texas A. & M. in '33. He majored in Civil Engineering during the four years he was there. Augmenting his scholastic training at the university he worked with his father between semesters and while on summer

● Left: Adnun blacktop spreaders place a 15-inch layer of soil-cement over the old road surface. Right: Pushing a La Plant-Choate sheepsfoot roller, this Allis-Chalmers tractor closely follows the spreaders, compacting the soil-cement.

HIGHWAY



● General view of the $30,000 Heldenfels soil-cement plant. Constructed so that it can easily be "knocked down" and moved to avoid long truck hauls, the plant produces 120 tons of soil-cement per 12-hour day.

vacation. Upon graduation he assumed executive duties with the firm and now superintends all of the firm's projects south of Rockport.

Traveling well over a thousand miles a week, overseeing the projects, he does as much traveling over roads built by Heldenfels as he can. Not from any perverted sense of loyalty, but to determine for himself the effects of traffic and weather conditions on the roads they have built.

J. R. Heldenfels takes care of the materials end of the business from the Corpus Christi office. He also superintends the dredging of "mud-shell" which is widely used in this area for streets, roads and driveways.

H. C. Heldenfels has charge of the branch located in Rockport, where a materials and contracting office is located. He superintends all projects for the concern north of that point.

Fred W. Heldenfels, Sr., is still actively engaged in the management of the concern. His duties confine him to the office and care of the financial end of the business.

No regular paving job, the Kennedy County piece of road work involves an entirely new material technique and a new design in road machinery.

Developed and tested, according to Fred Heldenfels, Jr., by the Texas State Highway Department, this material has proven itself satisfactory. However, this is the first time these specifications have been used on an extensive piece of road construction.

Some time ago a stretch of highway was constructed similar to the specifications of the Kennedy County project. Two and a half miles of road was laid, the mix being made by road-mix method, in the same stretch of country the main road is located. After curing and topping, a number of state highway department trucks loaded to capacity, were driven over the surface. Back and forth, up and down, day after day, this grueling punishment was meted out to the pavement. For three weeks this test was kept up, at the rate of hundreds of loads per day, but the new surface came through with flying colors.

According to M. M. Jester, Heldenfels' superintendent on the job, a block of this processed material can be immersed in water for an indefinite period of time and there will be no sign of deterioration. A piece of the soaked material can be rubbed in the hands without leaving any marks or smudges.

Shifting Sands A Problem

Out across the shifting sands lies the right-of-way of Kennedy County's new highway. Acres and acres of sand dunes, composed of the finest sand imaginable. Sand so fine that the ever-blowing trade winds out of the south carry it into the air and it looks like fog. These marching sand dunes are an additional problem to be faced by the builders of the road.

As an illustration of the men-

● **Left: After the soil-cement surface is thoroughly mixed and watered, weighted pneumatic rollers are drawn over it by a McCormack-Deering Farmall. Right: Cotton mats are spread over the rolled and dampened roadbed to allow the mix to cure.**

● Material from the feeder passes over this vibrating screen to the shredder which in turn passes it on to the pug-mill.

ace and the rapidity of the constantly marching dunes Heldenfels unearthed three line fences, one on top of the other, while digging through one 18-foot dune.

This menace is being solved partly by the Missouri-Pacific railroad, whose tracks parallel the highway. These tracks have been completely covered at times making transportation impossible until the tracks have been shoveled. At first grass was planted from time to time, but it blew away or dried up before it had time to take root. In sheer desperation the railroad contracted to have over fifty acres planted in grass and then covered with brush. It is hoped the brush will hold the grass long enough to block the relentless onslaught of the marching dunes.

At intervals along the right-of-way there are several deposits of clay which served as a source for the original roadbed material. After the grade was established a six-inch layer of clay was deposited along the right-of-way. This was exposed to the weather, the cattle, and some slight travel for a minimum of eight months. In this length of time the clay had packed and the elements had hardened it sufficiently to hold the finished highway.

From these same clay pits Heldenfels are excavating the material for the soil-cement stabilized base of the highway.

A $30,000 processing plant is built in the center of the deposit and material hauled to it. As the work progresses the plant will be moved to other locations.

Although the basic material for the mix is obtainable merely for the cost of excavation, most of the contractors were afraid of the job. Wet, soggy clay is not the easiest material in the world to handle. Heldenfels solved the problem by installing an entirely new type of equipment. Augmenting this with rebuilt equipment they already possessed they are making an extremely difficult task look very easy.

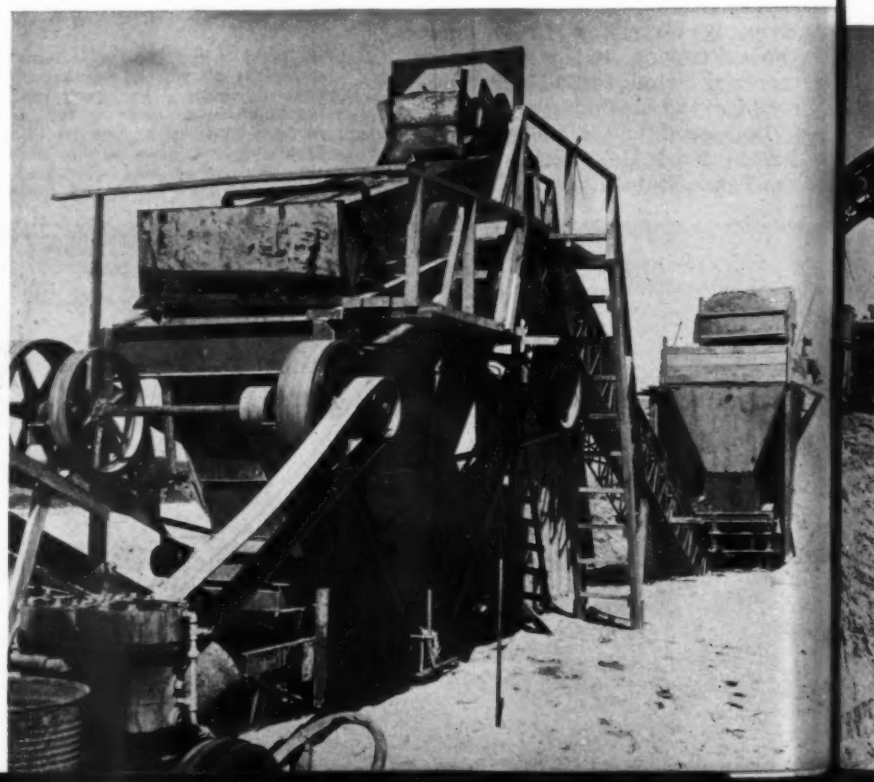
Water Table Limits Borrow Depth

Each of these clay deposits lies on top of a water table. This presented another problem as excavations more than five to six feet in depth filled up with water over night. Furthermore, the plant had to rest on a soil-cement stabilized base or it would collapse. All the truck runways, from the road to the mixer, under the mixer and back to the road, had to be of this same material. Even the walls of the ramp under the mixer and back to the road, had to be lined with the "stabilizer" to keep the water from seeping through and filling the pit.

As it is impossible to excavate very deep, a Northwest dragline equipped with a 1½-yard bucket is used to scrape off the surface of the deposit to a depth not exceeding four feet. Trucks haul the excavated material from the dragline to the feeder. In some cases the trucks are forced to make a haul of more than half a mile as the dragline works further and further from the point of operations.

In the second placement of the processing plant there will not be a ramp leading to the hopper of the feeder. It will be less expensive to excavate under the hopper until it can be loaded at truck-level than to build another twelve foot ramp.

The feeder into which the material is dumped by the trucks is a Pioneer Engineering Works project. Designed for just this type of work it has a screw-type feeder. This feeder is necessary to break up the wet material and assure an even flow to the screen and clay-shredder. From the feeder an endless belt conveys the material to the vibrating screen. This screen allows material of less than a half-inch to pass through. As the wet clay has a tendency to lump



● Overall view of the Pioneer screening and shredding unit which prepares the clay and soil for the pug-mill mixer.

a man is stationed at the screen with a rake to break-up and spread the material. Attached to the screen are several chains which further spread the material. The soil which will not pass through the screen drops into a hopper above the clay-shredder. Here the material will be broken up to a size that will mix well at the pug-mill.

Coming out of the clay-shredder and the screen the soil is conveyed on another endless belt to the hoppers of the pug-mill mixer. The clay shredder and screen are also Pioneer products.

Two 4,000-pound pug-mill type mixers were made by Madsen Iron Works. Specially built doors and weigh-boxes were necessary to facilitate the passage of the clumping wet material from the bin through the weigh-boxes into each mixer. Drop-doors on the bottom of the weigh-boxes are arranged so the whole bottom drops down. When the doors drop it leaves a sheer side so the sticky clay will not accumulate. A little better than 120 tons of the mix is processed and hauled away per hour.

In the average road construction where asphalt is used there is a steam plant in connection with the rest of the processing plant. As there is no need for steam on this project the doors of the pug-mill are operated by compressed air.

● Clay for the soil-cement plant is borrowed by this Northwest dragline. As this deposit is just above the water table, maximum digging depth is 4 feet.

The compressor does not need an additional power unit as it is driven from an existing line-shaft. Practically all of the drives were designed and made on the job.

The pug-mill produces the soil-cement mix according to specifications. Material is weighed in to the mill and the mix is made on a 6% cement, 15% moisture and the balance soil basis.

Working in two 6½-hour shifts an endless procession of trucks swing down under the doors of the pug-mill, pause a moment for their load, and are on their way back to the spreaders on the road.

Spreading Soil-Cement Mix

Two Adnun blacktop spreaders are working side by side along the roadbed. This too is necessary. Under ordinary conditions one spreader is used, the spreader depositing its material for a thousand yards or so and then working along the other side of the right-of-way. However, soil-cement construction demands the whole roadbed be laid at the same time.

Several changes were necessary in the two units involved. To allow the spreaders to deposit the mix at least fifteen inches deep, the machines were raised about ten inches. All braces and cross members were welded to the original parts of the spreaders, one of which belongs to the Heldenfels while the other is rented.

Side by side the two spreaders advance slowly along the right-of-way, leaving behind them a deposit of well mixed soil-cement, fifteen inches deep. As soon as a short stretch is laid down a sheepsfoot roller is used on the mix. Back and forth, back and forth, a La Plant-Choate sheepsfoot roller is pushed and pulled by an Allis-Chalmers tractor over the material until it is so compressed and concentrated that the roller no longer can make an impression on the surface.

A maintainer follows the roller to keep the grade. Specifications demand the compressed mix be six inches deep in the center and eight inches deep on the sides. There is an exaggerated crown on the roadbed under the mix and these specifications bring about a normal crown.

Following the maintainer are two pneumatic rollers. These rollers also travel back and forth over the roadbed, further solidifying the newly laid base.

After the rolling has been completed to the satisfaction of the

(*Continued on page 546*)

● The finished soil-cement flows from this hopper to trucks which transport it to the spreaders working on the road.

● A 3-ton rock is rooted out of the Rio Grande's right-of-way by a Bucyrus-Erie 32-B.

READY *for* WINTER

The Rio Grande railroad widens a cut through Soldier Summit, Utah, to facilitate snow removal from its right of way.

By W. A. DOWNEY and DON WIMMER

SNOW REMOVAL at high altitudes has always been a difficult and thankless job for the railroads. The troubles of the Rio Grande railroad operating mostly through desert and mountain territory, are no exception to this rule. Snow piles up on the tracks and the right of way and must be removed in order that train schedules may be met.

One of the most difficult places on a mountain railroad system are the summits of the passes, as every maintenance of way superintendent knows to his sorrow.

The problem at Soldier Summit, Utah, was to widen the deep cuts along the main track and adjoining the switch yards, so that a space could be provided for the dumping of snow from the tracks.

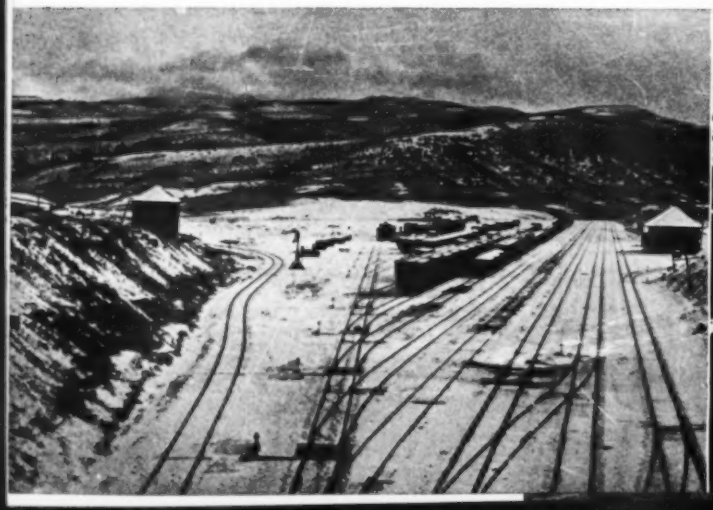
The soil in this high altitude consisted mainly of clay, gravel, loose rock and shale, a mixture not so difficult to excavate, but presenting a serious problem of excavating and removal, without the introduction of trained service.

Roadmaster H. J. Willard decided to use one of the company's five Bucyrus-Erie draglines and a Bucyrus-Erie shovel for the job. Starting early in the summer, the 1¼-yard machines were put to work, with standard railroad dump cars for removal of aggregate where it was not convenient or desirable to convey the excavated material to the top of the cut.

Approximately 11,550 yards of excavation was involved. The dragline was a natural for operating alongside or on the railroad tracks, averaging 550 to 900 yards daily at a cost of $25 for operator, oiler, gas, oil and grease.

The dragline was used on the north bank adjoining the switch and storage yards, with the bucket working from the bottom toward the top. Material was dumped back from the top of the embankment. The south bank was loose, providing precarious footing for a dragline. The 1¼-yard shovel was called in for this job, biting direct-

● Left: View of Soldier Summit cut before widening operations. Note how close slope of left bank is to the tracks. Right: After widening operations, which will allow room for snow removal.



ly into the side of the embankment and loading onto rail air dump cars, manned by the regular rail crew.

The peculiar requirements of the job, necessitating the maintenance of a clear right of way for train movement at all times, placed the dragline to much better advantage than the more restricted range of the shovel while operating directly alongside or on the tracks, in the restricted working space. With its long sweep of boom, the dragline had no difficulty in clearing the tracks of dirt and rocks quickly without moving, as compared to the necessity of the use of maintenance crews to keep the tracks clear under the dump cars.

Many one to three-ton rocks were encountered on the job. These were disposed of easily in regular routine and either hoisted to the top of the embankment or dropped into the dump cars.

Several hundred yards of the excavated material was dumped into a ten-foot wall of dirt and rock alongside of the "Y" to act as a snow breaker against the terrific drifts in winter, normally rolled into eight to ten-foot piles by the almost continuous winds sweeping up over the pass. The idea of the earth snow breaker originated with L. A. Kane, Rio Grande trainmaster.

Low Operating Cost

The use of the dragline and shovel to dump directly on higher ground or into railroad dump cars simplified the excavation of the comparatively loose earth material and kept costs down to machine crews, except for ten days when train crews were used to operate the dump cars, of the approximately two months required for the work. Daily operating costs with the train crew operating the dump cars approximated $125. Operating cost on days during which the train crew was not used was reduced to $25 per machine, or $2.50 per hour.

The ease with which the cater-

(Continued on page 546)

● **Top: Perched atop the railroad cut bank, this Bucyrus-Erie dragline graded and trimmed the slope. Bottom: H. J. Willard (right) roadmaster, watches the 32-B load to the railroad dump cars.**

EXCAVATING ENGINEER

FOUNDED 1905

A Monthly Publication

Devoted to the Excavating Industry

The Excavating Engineer Publishing Co.
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AGC Ready for Defense Construction

A recent statement by Managing Director Edward J. Harding of the Associated General Contractors of America shows how completely the construction industry is equipped and prepared to perform the big job of national defense construction with the necessary speed, quality and economy.

In outlining the defense problems of the country Mr. Harding said:

"Before the country can arm, equip and house an army of 2,000,000 men and a navy twice the present size, new plants must be constructed for manufacture of arms and supplies, means of transportation must be improved, men and materials must be given shelter, and many other facilities must be built. On the speed with which this job is done depends much of the speed with which the whole defense program can proceed. This means that the job for the construction industry is of vital importance.

"The industry is equipped and prepared to perform all national defense construction with the necessary speed, quality and economy.

Continuing, Mr. Harding outlined the forces that will enable the contractor to meet defense construction requirements.

Size. "The size of the construction program determines the ability of the industry to perform it without delay. Final estimates of the ultimate amount of construction in the defense program cannot be made accurately now. For the first phase of the construction program approximately one billion dollars in federal appropriations for construction purposes are now available or soon will be available. In the near future approximately another half billion dollars of private funds or government loans will be used for construction.

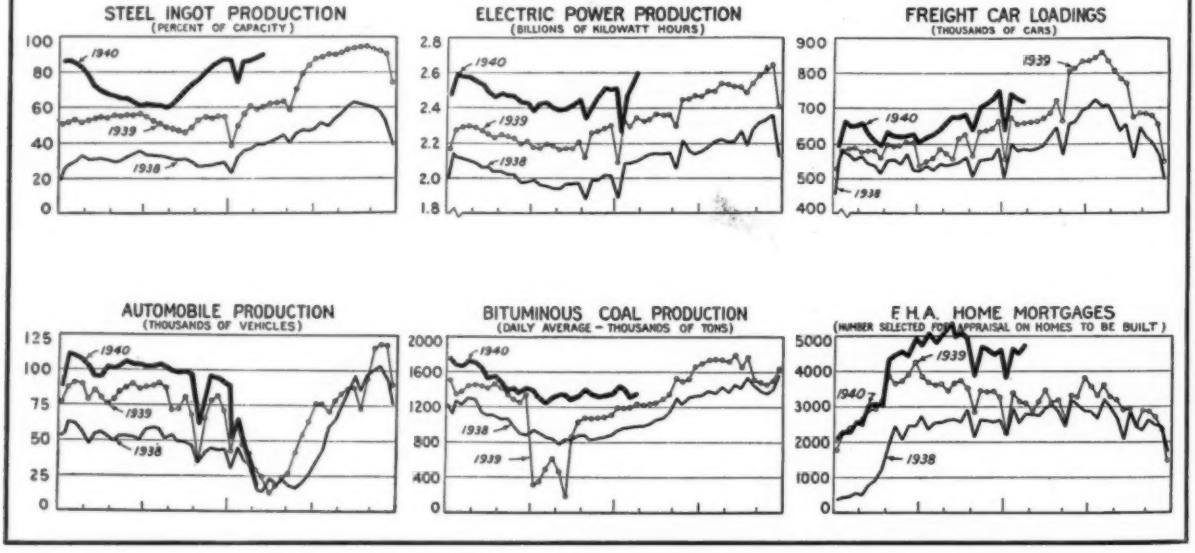
"This gives a total defense construction program of approximately a billion and a half dollars to be started this year and next. This is a large amount of construction. Yet in terms of yearly volumes of construction it is less impressive, being about one-eighth of the present yearly capacity of the industry.

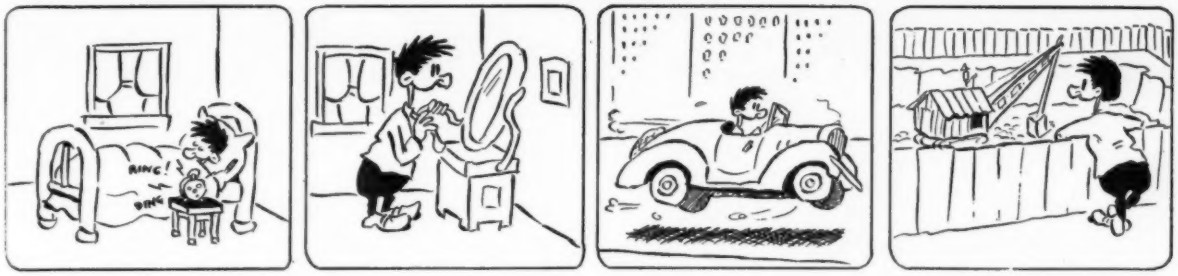
"A survey recently made by the Associated General Contractors of America indicates that the present capacity of the construction industry is approximately 12 billion dollars a year. The total volume of construction for 1939 was approximately $9,947,000,000. It is estimated that in 1940 an increase in the amount of private construction will be more than balanced by a decrease of public construction, so that the total volume of construction, including defense construction, is not expected to exceed the 1939 total.

"This means that there will be an unused capacity of approximately two billion dollars. The defense construction program offers nothing in size which the construction industry cannot handle easily. The defense program will simply take the place of the Public Works Administration program, which is substantially completed and was equal in size to the defense construction program.

General contractors. "The general contracting branch of the industry has the central responsibility for coordinating all the facilities of the industry, and for actual construction of projects. The A.G.C. has found that there are enough competent, adequately financed contractors so that general contracting will become no bottleneck.

WEEKLY BUSINESS INDICATORS





Man-power. "Available manpower is a controlling factor in the volume of construction which can be performed annually. The A.G.C. survey accounted for approximately 2,600,000 construction workers, adequate for an annual volume of 12 billion dollars. In the tabulation full account has been taken of such loss of manpower as has been sustained the past few years through aging of workmen, shift to other industries, and the training of relatively few new mechanics.

Equipment. "Plant and equipment owned by contractors has been conservatively estimated at a half a billion dollars at its present depreciated value, not at its replacement cost. Constant improvement of equipment increases the capacity of the industry. No shortage of new equipment is foreseen, although many manufacturers will be making war materials.

Materials. "No shortage of supplies or materials is foreseen in the near future.

Type. "Much of the construction for the defense program will be of ordinary or simple type which large numbers of contractors will be able to perform easily. Other projects will be specialized and complicated. But the construction industry has been cooperating with all American industry, and the Army and Navy, in the construction of specialized facilities for many years. New records are being made constantly for the speedy completion of specialized projects.

Location. "Much of the defense construction will be located in out of the way and sparsely inhabited locations. But the construction industry by its nature is a mobile industry, for it is a normal procedure to construct unusual projects in unusual locations.

"It is normal for the industry to mobilize small armies of construction workers for jobs unprecedented in size for the community. It is a characteristic of the industry that it draws its workers from the locality of the project, but augments these with workers from other places. This mobility is one of the fascinations the industry has for many workers. The construction of such giant projects as Boulder Dam and Grand Coulee Dam demonstrates the capacity of the industry to undertake even its largest projects in distant localities.

"The type of cooperation which the construction industry has already given the government in the defense program is illustrated by a report of Secretary of Navy Knox at a press conference August 7. He said the construction of naval air bases in the Pacific had progressed at so rapid a rate that they would be ready for use months ahead of the time fixed in the construction contracts.

"Rear Admiral Claude C. Bloch, commandant of the Fourteenth Naval District, at Honolulu, had reported to him, he said, that the bases are not only being completed ahead of schedule, but also with substantial financial savings to the government.

"The present defense program emphasizes the progress which has been made in the construction industry since World War I. Since that time the industry has experienced the skyscraper era, has built the majority of the giant reclamation, flood control and power projects, and has covered the country with a network of highways, the work of an entirely new branch of the construction industry.

"The industry and general contractors now are ready and prepared for any emergency."

Residential Contracts Ahead For First Six Months

On its first six months' record, this year of otherwise mixed construction trends is proving to be the biggest home-building year since 1929. In a recent statement, F. W. Dodge Corporation reports that residential building contracts let during the first half of 1940 in the 37 eastern states amounted to $690,572,000. This was an increase of 7 per cent over the first half of 1939 and was more than six times the dollar volume of residential contracts in the first half of 1933, lowest depression year.

These over-all dollar figures tell only a partial story of residential building progress. The number of single-family houses included in the contract record increased from 74,315 in the first 6 months of 1939 to 90,910 in the first 6 months of 1940, a 22 per cent rise. Combined with increases in two-family houses, combination buildings and converted units, and a decreased number of units in apartment buildings, the figures for total new dwelling units were 141,811 this year, compared with 127,056 in 1939. The greater percentage increase of dwelling units, as compared with dollar increase, is an obvious reflection of increased volume of low-priced houses, and a measure of the progress which builders are making in developing the low-priced market. Out of the $46,000,000 residential contract increase over last year's sixmonths' record, $37,000,000 represented the increase in private housing investment and $9,000,000 the increases in public housing projects.

The two most important classifications of private non-residential projects, commercial and manufacturing buildings, also showed substantial increase over the first half of 1939. The dollar volume of commercial building contracts, amounting to $142,396,000, increased 23 per cent; and manufacturing building contracts, amounting to $111,828,000, increased 47 per cent.

The combined half-year total of all private building contracts, $937,867,000, was nearly 13 per cent greater than the figure for the first half of 1939.

Casting for Coal

Gaylord Mining Company depends on two draglines to meet its coal mining contract for the Glen Alden Coal Company at Plymouth, Pennsylvania

AT PLYMOUTH, Pennsylvania, Gaylord Mining Company is mining anthracite coal for the Glen Alden Coal Company. Two seams of fine anthracite coal, the Bennett and the Cooper veins are being mined by the open cut method. Overburden throughout the job averages 45 feet, and runs as high as 60 feet in some places. At the time the job was visited, operations were at a place where the two veins lie together. The combined thickness of the two is about 30 feet.

Stripping and Loading Operations

Two draglines handle both stripping and loading except when conditions are favorable for uncovering a large section of coal at one time. When that occurs, a ramp is built down to coal, and a Lorain 75 shovel moved in to handle the loading. The two draglines are a Bucyrus-Erie 54-B swinging a 3-yard bucket on an 80-foot boom, and a Lorain 95 equipped with 2-yard bucket and 70-foot boom. These machines cast material to spoil piles when stripping, and load 5-yard Mack and Brockaway trucks with the coal. A Bucyrus-Erie bulldozer on an International T-40 TracTrac-Tor maintains hauling roads.

Operations are carried on in two 7-hour shifts daily. Digging is tough, with about 85 per cent

(Continued on page 546)

● **Top of page: A Lorain 95 scoops up a 2-yard load of overburden. Left: Three yards of dirt hit the spoil pile as this Bucyrus-Erie 54-B dumps its bucket.**

W. A. KIKER

L. C. YOUNT

KIKER & YOUNT

BRIDGE AND HIGHWAY CONTRACTORS

REIDSVILLE, N. C.

C. C. GAITHER

June 7, 1940

E. F. Craven Company
Greensboro
North Carolina

Attention: Mr. E. Asbury Craven

Gentlemen:

We have been operating one of your new 108 h.p. Diesel Motor Tractors long enough so that we feel that we are in a position to give you a reasonable picture of our experience with it. This tractor, as of present date, has operated a few more than 2,000 hours since September 4, 1939.

We have been able to notice the saving in grease and time as a result of the 200 hour front idlers and truck rollers. The saving in grease of course means cheaper operating cost, and the saving in time means more hours on pay operations. We are amazed at the fact that in the equivalent of one year of operating, we have had to grease these parts only ten times.

The general operation of this machine has been satisfactory. It has come nearer operating all of the possible hours than any other piece of equipment which we have on our projects.

The motor, at present, seems to be operating as well as it did when we put it into service last fall. The oil consumption on it amounts only to the customary changes.

We find that with the electric starter, under all weather conditions, we are able to save from one half to three hours per day in getting started in the mornings.

Our operators have really taken to the new HD 10 and Grade Builder which you delivered to us last week. They have operated about all types of equipment competitive to this and say that this machine is by far the nicest all around piece to operate.

Very truly yours,

KIKER & YOUNT

By

EMK:b

ONE OF FIRST USERS

Among others in various parts of the country, Kiker and Yount saw profit-making possibilities of the 2-Cycle Diesel — bought one of the first (shown at right with 10-yd. Gar Wood 2-wheel scraper). Since have added the HD-10, 79 drawbar h. p. 2-Cycle Diesel (see letter and photo at left).

ALLIS-CHALMERS

TRACTOR DIVISION — MILWAUKEE, U.S.A.

2-CYCLE DIESEL POWER

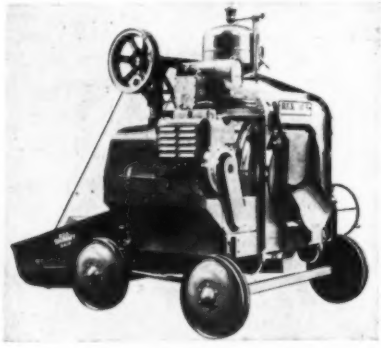
3 SIZES ... HD-7, HD-10, HD-14
54 TO 108 DRAWBAR H. P.

Equipment

you ought to KNOW ABOUT

Rex 10-S Mixer

Chain Belt Company, Milwaukee, Wisconsin, announces a new Rex 10-S mixer. This new Rex mixer is being produced with an air-cooled motor which has already been successfully used on Rex 5-S and 7-S mixers. According to the manufacturer, the air cooled engine has many advantages, among them being: there



is no radiator to damage, no housing to remove, no water pump to cause trouble, no greasing (all lubrication self-contained and automatic) and no cylinder block to freeze. Features as claimed by the Chain Belt Company include Rex Shimmy Skip, Rex outside pivoted 7 second discharge, Rex modern drum, Rex positive water system and freeway valve, Rex Timken drum rollers, Rex chain drive and Rex fully enclosed transmission countershaft. Further details may be obtained by writing direct to the manufacturer.

Thor Air Grinders

Based on the new "air behind the blades" principle, a new Thor portable air grinder, the No. 255, has just been announced by the Independent Pneumatic Tool Company, 600 West Jackson Blvd., Chicago, Illinois.

The "air behind the blades" keeps the rotor blades of the grinder out against the cylinder wall, preventing any "dead center" position or the depression of the blades in the slots due to oil accumulation. As a result, positive

When writing to manufacturers please mention Excavating Engineer.

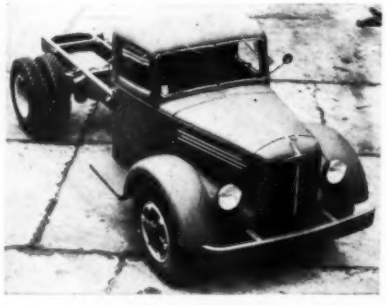
starting is assured under all operating conditions.

The new No. 255 grinder is but one of the Thor line. There is a separate series of grinders for light, medium, heavy, and extra heavy types of production grinding, as well as small wheel grinders. For further information on these Thor grinders, write the above company for circular P-25.

Heavy Hauling Truck

Just announced by Mack Trucks, Inc., is the production of a new truck model, the LM, designed expressly for heavy hauling. The cab of the new LM has such standard fittings as chromium-plated windshield frames, two intake and two exhaust ventilators, dual windshield wipers, dome light, rear view mirror, felt-lined glove compartment, coat hooks, headlight beam indicator, and shatterproof glass is also standard throughout. Its overall width measured at the belt molding is 68".

The new model LM is offered



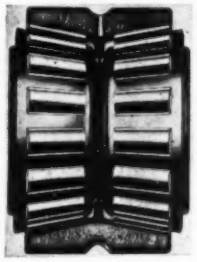
in two standard wheelbase lengths of 176" and 194" respectively. Special wheelbase lengths of 212" and 230" are available at the customer's wish at extra charge.

The LM is powered by the six-cylinder model EO Mack Thermodyne engine with 4⅜" x 5¾" bore and stroke developing 142 h.p. at governed speed of 2,200 r.p.m. Total piston displacement of this engine is 519 cu. in. and it has a compression ratio of 5.4 to 1. Torque developed is 378 lb. ft. at 1,000 r.p.m.

More detailed information may be obtained from your nearest Mack dealer or by writing direct to Mack Trucks, Inc., 34th Street and 48th Avenue, Long Island City, New York.

Timken Roller Bearing

The Timken Roller Bearing Company has recently released a modification in the design of the standard NA type, or non-adjustable, Timken roller bearing made up of a double row outer race or cup and two single row inner races or cones. The races and rolls are ground to established precision limits so that when the cones are assembled into the cup the front faces of the cones contact and the proper running clearance is provided. The front cone faces are slotted and chamfered as shown to provide an entrance for lubricant to within the bearings. In some sheave blocks, lubricant may be introduced through a fitting in the sheave hub, and for this design an annular groove and holes are provided in the cup.



The problem of sealing the bearing chamber has been simplified by extending the length of the large cone rib and creating a surface concentric with the shaft and sheave bore on which a seal may be run. These seals have the same O.D. as the cup and are pressed into the sheave bore and thus are used to hold the bearing together during assembly.

The bearings are designed to a minimum width and with an I.D. large in relation to its O.D. and also with a maximum radial and thrust capacity for the space occupied. Being an anti-friction thrust bearing as well as an anti-

What's behind this straight-out "O.K." of RPM DELO lubrication? Months of bulldozing, dirt moving, logging, farming, by powerful Allis-Chalmers Diesel tractors working "with their sleeves rolled up!"

Allis-Chalmers adds its field experience to the many millions of hours of outstandingly successful RPM DELO lubrication in all types of Diesel engine operation throughout the world—and every hour of this tremendous total proves again—

That RPM DELO *stops ring sticking* in any Diesel in the hottest, hardest operation. That RPM DELO *ends* sludge trouble—that it cuts engine wear to an *all-time low*—that it assures *super-smooth* engine break-ins.

Some oils do some of these things—some do others. *But RPM DELO is one lubricating oil that does ALL of them for ALL Diesels—yours included.*

It's made to make your engines run better—last longer—need fewer overhauls. Let your Diesel equipment show you that it *does!*

UNEQUALED FOR EVERY DIESEL

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DIESEL ENGINE LUBRICATING OIL

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Standard Oil Company of Nebraska
Standard Oil Company of California
Standard Oil Company of Texas
Utah Oil Refining Company

Dial RPM DELO:
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Colonial Beacon Oil Company
Standard Oil Company of Louisiana
Standard Oil Company of New Jersey
Standard Oil Company of Pennsylvania

Kyso RPM DELO:
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RPM DELO is available through distributors in more than 100 countries.

STANDARD OIL COMPANY OF CALIFORNIA

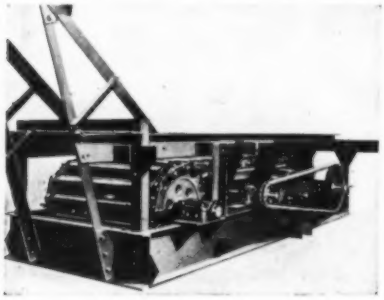
For your convenience in writing to Standard Oil Company of California, you will find a card bound in this issue.

friction radial bearing, the sheaves may rotate freely without axial float.

New Traveling Grizzly Feeder

Pioneer Engineering Works, Inc., Minneapolis, Minnesota, have recently placed on the market their new Pioneer Traveling Grizzly Feeder.

The purpose of this new "Traveling Grizzly" is to feed a steady stream to the primary crusher, handle the large rocks without delay, and to by-pass the dirt and small materials around the crusher. A clutch, with controls on the operator's platform, permits accurate control of the feed. If a rock is too large for the crusher, the feeder is stopped, the rock broken by sledge, and the feeder



started with no delay to the crusher. If there is an excess of dirt in the rock, a screen can be located below the feeder, the dirt rejected, and the rock delivered onto the conveyor with the product from the primary crusher.

Full information and details on the Traveling Grizzly Feeder may be obtained from the Pioneer Engineering Works, Inc., 1515 Central Avenue, Minneapolis, Minnesota.

Improved Brake Lining

Facility in meeting widely varying dimensions in brake lining and clutch facings with a limited stock of material is afforded by improved woven-moulded brake lining sheets announced by the Gatke Corporation, 228 North La Salle Street, Chicago.

The manufacturer states that Gatke Makablock, as this improved sheet stock has been named, is tightly woven of select long fibre asbestos yarn and soft alloy wire—saturated with a high heat-resisting frictional compound by a special process—compressed to great density and surface ground to uniform thickness.

From a sheet of correct thickness brake liners and clutch facings can be sawed quickly and accurately to the required size. The material readily conforms to

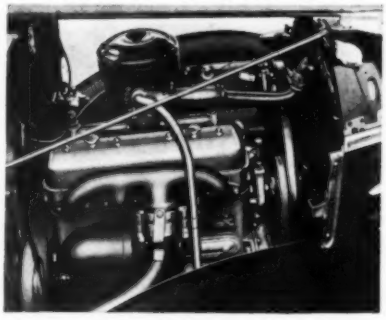
any drum diameter and can be used for either internal or external type brakes. It can also be used for cone type, as well as disc clutch facings.

Gatke Makablock is furnished in rolled sheets 20 inches wide x 5 feet long in $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, and $\frac{1}{2}$ inch thickness. Your request for further information should be addressed to the above company.

Diesel Replacement Engines

Officials of Hercules Motors Corporation, Canton, Ohio, have just announced the development of a Hercules diesel replacement engine for the 1940 conventional model Chevrolet truck and that a replacement diesel for the 1940 cab-over-engine model will shortly be available. These replacement engines will be marketed through a nation-wide distribution set-up.

It is claimed that installation of the Hercules diesel engine in the Chevrolet truck chassis is quickly acomplished by any good mechanic with one helper. No ma-



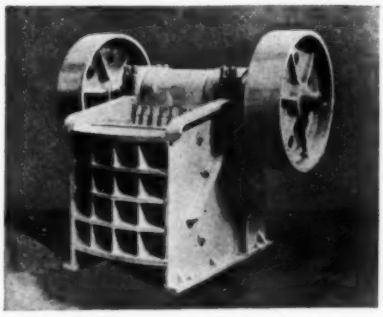
jor changes in the chassis are necessary. The engine is started with the same button used for starting the gasoline engine regularly furnished in Chevrolet trucks. Speed is controlled by foot accelerator and the engine is stopped by a slight pull on a conveniently placed handle on the dash. Further details are available from Hercules Motors Corporation or your nearest Chevrolet dealer.

New Jaw Crushers

Two new jaw crushers have just been announced by the Diamond Iron Works, Inc., Minneapolis, Minnesota, made in sizes 20x36 and 24x36.

The long jaw design and contour of the breaker plates assure more positive grip and crushing effect on the upper or feed end of the jaws, and produce a more uniform product by preventing larger stone and slabs from passing before reduction.

The main frame is all welded from heavy steel plate. The eccentric pitman shafts are forged from special alloy steel to rough



dimensions, machined, heat treated, ground and polished to accuracy for bearing fits which are heavy duty roller types with rating for shock loads far in excess of hard rock crushing factors. All bearings are equipped with flush and drain openings for cleaning old grease from them when advisable.

Product size adjustments are by reversible hand lever ratchet raising or lowering the adjusting wedge against the rear toggle seat. Adjusting mechanism is enclosed for dust and dirt protection. The cast iron toggle has chilled bearing edges. This toggle is designed to break, if large pieces of tramp iron or other uncrushable materials jam the jaws, thereby protecting the expensive parts of the crusher.

Miner's Protection Suit

Mine Safety Appliances Company, Pittsburgh, Pennsylvania, announces the new M.S.A. miner's protection suit, a durable rubber suit constructed to withstand the hard wear encountered in tunneling, mucking, drilling and other operations where the workman is

(Continued on page 543)

SAVING

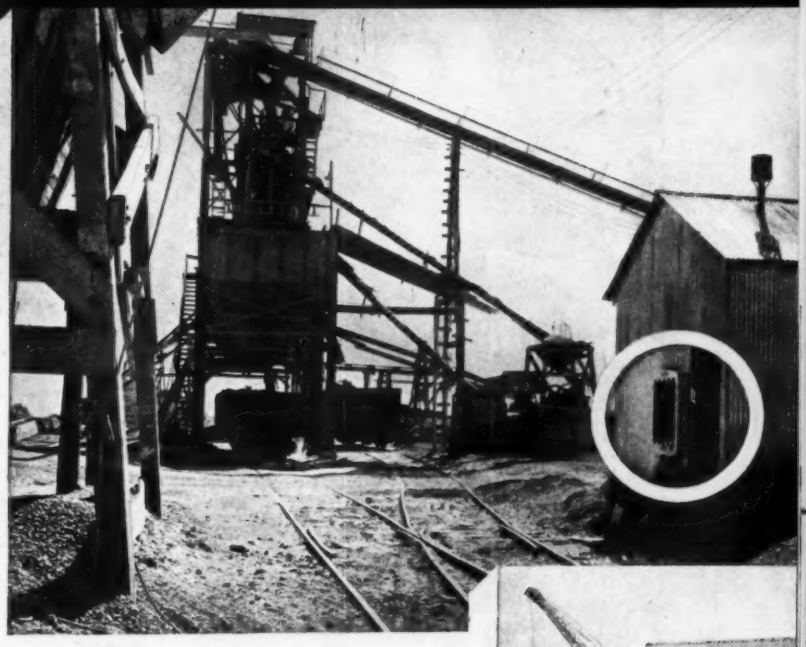
$2200.00 a year!

By DRIVING its entire plant with a "Caterpillar" Diesel Engine, the Fordyce Gravel Co., of Pharr, Texas, has cut its annual power-cost from four thousand dollars to *only eighteen hundred!*

Low consumption of low-cost fuel does it . . . and so does "Caterpillar" Diesel heavy-duty construction which holds maintenance-repairs to a minimum.

There is plenty of other evidence on hand, from hundreds of other owners, to give you a good idea of how much money you can save on annual power-costs with "Caterpillar" Diesel! Ask your nearest "Caterpillar" dealer for it, or write direct to the factory today. *Specify "Caterpillar" Diesel Power when you purchase equipment.*

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS



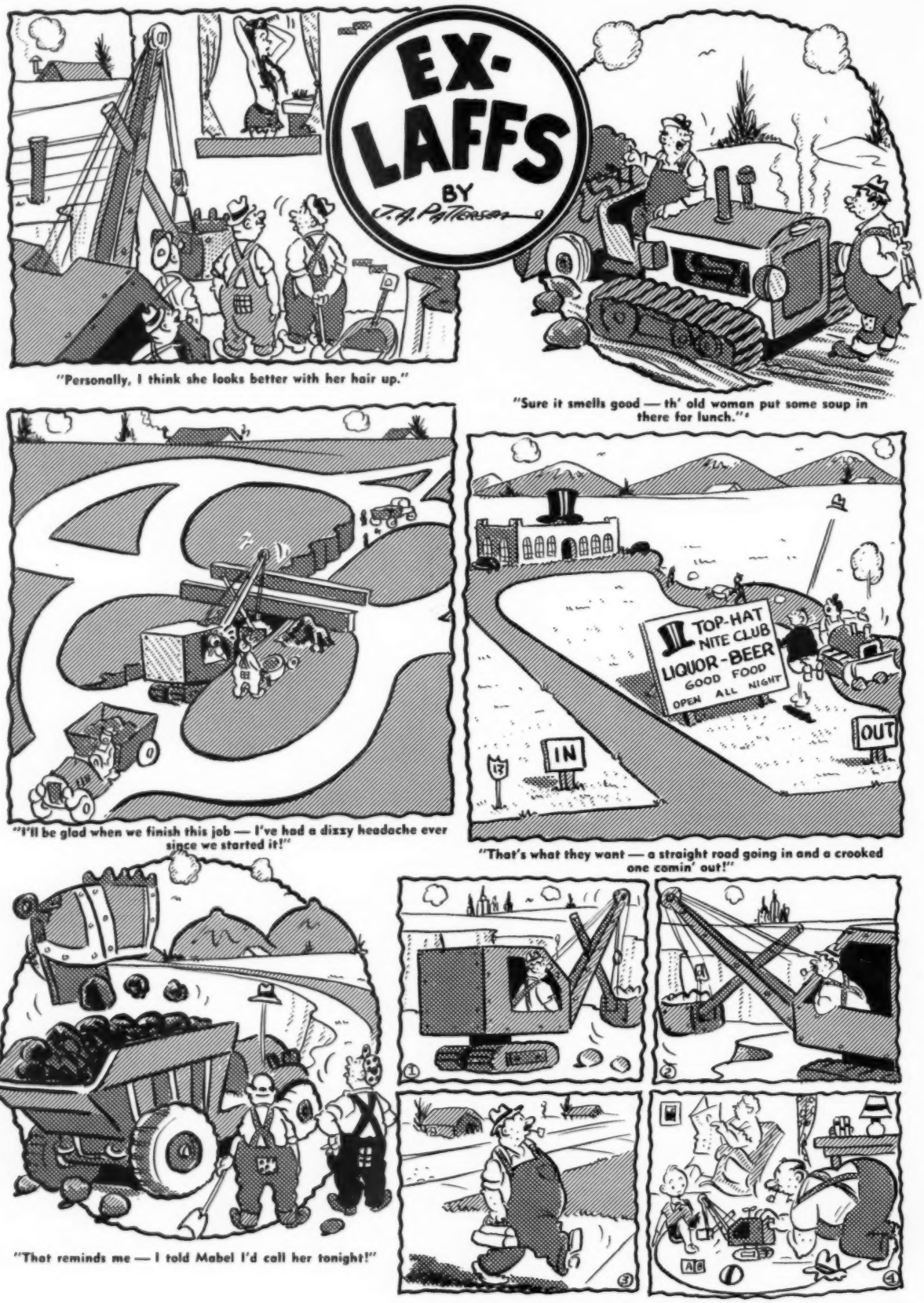
• The Sullivan City (Texas) plant of the Fordyce Gravel Co., which is powered entirely by a "Caterpillar" Diesel D13000 Engine driving a Westinghouse generator. Engine uses only about 5 gallons of 4-cent fuel an hour!

• Another "Caterpillar" Diesel Engine owned by the Fordyce Gravel Co. This one is 7 years old — and has run a total of 21,000 hours! Repairs, in all that time, are estimated at only $275. Belted to a generator, this engine powers a 1¼-yard electric shovel which handles 120 yards an hour. Engine uses only 3 gallons of low-cost fuel an hour!

CATERPILLAR

REG. U.S. PAT. OFF.

DIESEL ENGINES and ELECTRIC SETS • TRACK-TYPE TRACTORS • ROAD MACHINERY


EX-
LAFFS
BY
J. A. Patterson
"Personally, I think she looks better with her hair up."
"Sure it smells good — th' old woman put some soup in there for lunch."
"I'll be glad when we finish this job — I've had a dizzy headache ever since we started it!"
TOP-HAT
NITE CLUB
LIQUOR-BEER
GOOD FOOD
OPEN ALL NIGHT
IN
OUT
"That's what they want — a straight road going in and a crooked one comin' out!"
"That reminds me — I told Mabel I'd call her tonight!"

DIFFERENTIAL STEERING!

—Power at all times on both crawlers

is a NORTHWEST

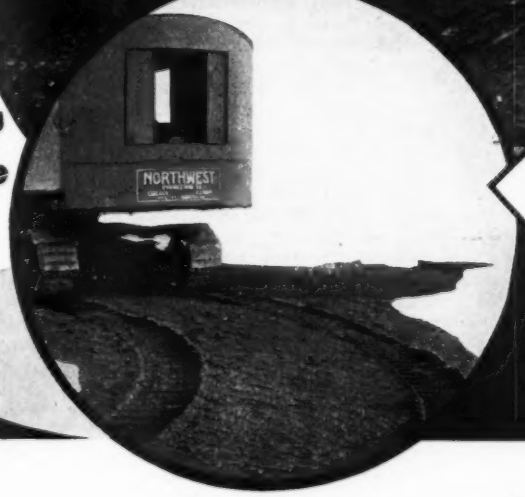
Advantage

NORTHWEST Differential Steering (on Northwests of 1 yard capacity and larger) gives you positive traction at *all times*—full power on both crawlers even when turning. Differential Steering brings you greater power and mobility when you need it most—in the tough spots it gets you where you want to go easier, quicker and with less delay.

What's your choice? *Mobility that negotiates all ground conditions* or mobility that limps around corners with only *one live crawler*—miring down in soft going and binding with destructive friction as it slides around, setting up strains that must eventually show themselves in repair bills and delay?

You need Northwest mobility—and once you have it you'll wonder how you got along without it. Why not let us tell you more about it?

Buy the crawlers that can handle the tough going and you can forget about the easy going!



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Built in a range of 18 SIZES 3/8 yd. capacity and Larger

NORTHWEST ENGINEERING CO.
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Shots from the FIRING LINE

New Dragline Installed At Company Party

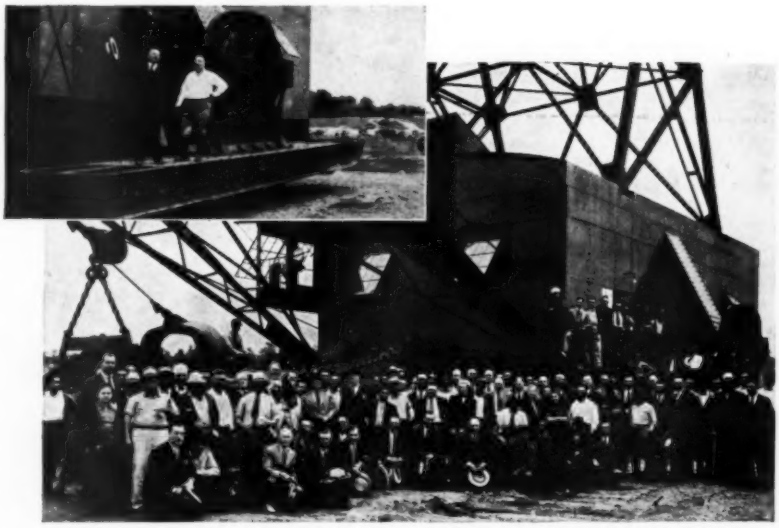
Carbon Limestone Company of Pennsylvania installed its new Bucyrus-Monighan 9-W walking dragline with appropriate festivities on June 22 at the company's quarry near Hillsville, Pennsylvania.

Nearly 1,000 visitors and guests witnessed the inauguration in service of the 9-W which weighed 910,000 pounds and was equipped with a 200-foot boom swinging an 8-cubic yard bucket. In addition to company employes, financial representatives from the steel companies at Youngstown and Pittsburgh, representatives of Bucyrus-Erie, Bucyrus-Monighan and Westinghouse Companies, visiting officials from other quarries and newspaper men, a large crowd of people from surrounding communities came to see the walking dragline in operation. Refreshments were served to guests from a tent pitched on the grounds.

Highlight of the celebration was the first official operation of the dragline by John G. Beck of Pittsburgh, Pennsylvania. Mr. Beck, a brother-in-law of F. O. Earnshaw, president of the Carbon Limestone Company, put the machine through its paces and moved the first bucketful of overburden with the new machine. The duties of guest operator were quite fittingly assigned to Mr. Beck as he operated one of the first draglines ever built during his early days on construction work.

Among the officials of the Carbon Limestone Company who played host to the visitors were Fred O. Earnshaw, president; J. H. Jackson, vice-president; Herbert W. Feather, assistant secretary and treasurer; and Harmon T. McCartney, safety director.

The new walking dragline is expected very materially to reduce the company's cost of quarrying the company's flux stone deposit which averages about 20 feet in depth and is under a 65-foot overburden.



● **Top: J. F. Tait of Bucyrus-Erie Company introduces John G. Beck, guest operator of Bucyrus-Monighan 9-W during installation ceremonies near Hillsville, Pennsylvania. Bottom: Part of the large crowd that attended the 9-W's inauguration.**

All-American Canal Opened

The All-American Canal, biggest irrigation ditch in the world, will be put in use this month, according to John C. Page, commissioner, Bureau of Reclamation.

Water diverted from the Colorado River at Imperial Dam will be carried by the 80-mile canal to provide a supplemental supply for the irrigation of the rich Imperial Valley, America's winter garden in Southern California.

The Imperial Dam and desilting works on the Colorado River were completed in July 1938, and major construction contracts on the canal itself were completed last summer. Clay lining of certain sections to prevent seepage, construction of a drainage channel, and test runs made early this year provided the finishing touches, and the canal is now ready to furnish water for the winter growing season.

Recently a section of the All-American Canal was pressed into emergency service after a severe earthquake shock damaged the Imperial Main Canal, which has served the Imperial Valley for many years, looping 50 miles through Mexico. The All-American Canal, so called because it is wholly within the United States, replaces the Imperial Canal.

Corpus Christi Airbase Contract "Cost-Plus-Fee"

Construction work, estimated to cost $23,381,000, will be done jointly by Brown & Root of Houston, W. S. Bellows of Houston, and Columbia Construction Co. of Oakland on the new Corpus Christi, Texas, Navy plane base.

Under its authority to award negotiated contracts for work within the United States on a "cost-plus-a-fee" basis the Navy has set the contractors' fee for the airport job at $1,200,000.

In awarding this contract, the Navy followed the same procedure and used the same form of contract which was developed last year in connection with the cost-plus work on overseas naval bases. A group of contractors selected from a list of about 250 firms in the files of the Bureau of Yards and Docks was called in and examined as to their ability to do the work. Selection was entirely on the basis of fitness.

Under the present plan the fee is set by the Navy; it is computed to cover profit, interest on money, expenses of the contractor's central office, and services of company officials and central office employees. In setting the fee, account is also taken of the degree of disruption of the contractor's normal activities. All other items are chargeable as cost to be reimbursed by the government.

Since the Navy conceives of the relation embodied in a negotiated contract as one of partnership rather than the buyer-seller relation of a competitive contract, the contract document is relatively short and simple.

Cost-plus-fee contracts require that the contractor furnish all plant, materials, and labor. Plant rental is paid according to a pre-arranged schedule designed to cover insurance, depreciation, taxes, and cost of operation. Repair of equipment at the end of the job to get it back to original shape can be charged as a cost. Materials become the property of the government as soon as the contractor takes delivery, thus avoiding insurance and tax costs. Wages and hours of labor are determined by the contracting officer, and all personnel must be satisfactory to him.

Work is to be done in accordance with whatever plans are furnished by the Navy, and the plans may be changed at any time; if the changes alter the magnitude of the job an adjustment will be made in the fee. On the Pacific bases a completion time was written into the contract, but no provision was made for liquidated damages.

The contract may be terminated by

STOP!
LOOK!
LEARN!

There's a minimum of time spent cleaning off the surface of the coal when you strip with a Bucyrus-Monighan. Accurate control lets your operator peel the overburden off without either wasting coal or leaving too much material to be bladed off by a bull-dozer. There's no need to sacrifice output to get accuracy, either. For 27 years Bucyrus-Monighans have been famous for the dependable day-in, day-out performance that adds up to big output and low costs.

BUCYRUS MONIGHAN

Sold by

Bucyrus·Erie

SOUTH MILWAUKEE, WISCONSIN

For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

EXCAVATION, EARTH OR COMMON—DOLLARS PER CUBIC YARD

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
Ark.	....	....	....	....	....	$0.25	$0.25	$0.29	$0.28	$0.28	$0.24	$0.20	$0.26	$0.21	$0.20	$0.26	$0.16	$0.20	$0.19	$0.20
Colo.	....	$0.44	$0.31	$0.33	$0.40	0.34	0.30	0.38	0.32	0.26	0.19	Changed to unclassified								
Conn.	$1.15	1.40	1.10	0.75	1.10	1.25	1.10	1.00	0.90	0.85	0.75	0.50	0.38	0.40	0.35	0.45	0.55	0.45	0.55	0.50
Del.	1.53	1.18	0.88	1.32	1.37	1.09	0.94	0.92	0.82	0.83	0.68	0.56[1]	0.34[1]	0.31[1]	1.04[1]	0.40[1]	0.63	0.60	0.41	0.41
Del.	....	....	....	....	....	....	....	....	....	....	....	0.84[2]	0.77[2]	0.74[2]	0.99[2]	0.73[2]	....	....	....	....
Ill.	0.92	0.50	0.47	0.48	0.47	0.50	0.45	0.47	0.43	0.38	0.37	0.26	0.31	0.30	0.31	0.38	0.44	0.35	0.31	0.37
Iowa[3]	....	....	0.25	0.26	0.23	0.22	0.23	0.26	0.21	0.19	0.18	0.15	0.12	0.13	0.14	0.16	Same as pavement grading			
Iowa[4]	....	....	0.57	0.66	0.73	0.68	0.46	0.47	0.39	0.32	0.34	0.28	0.16	0.17	0.22	0.18	0.18	0.15	0.12	0.10
Kans.	....	....	....	....	....	....	0.37	0.37	0.24	0.24	0.23	0.21	0.18	0.14	Changed to unclassified					
Me.	....	....	....	1.55	1.26	1.19	1.15	1.13	1.09	0.88	0.78	0.53	0.42	0.65	0.73	0.73	0.58	0.59	0.43	0.36
Mass.	....	....	....	....	1.26	1.07	0.90	0.77	0.71	0.63	0.50	0.32	0.20	0.36	0.38	0.32	0.33	0.55	0.25	0.34
Mich.[5]	1.01	0.82	0.52	0.65	0.54	0.46	0.49	0.48	0.45	0.41	0.34	0.21	0.19	0.28	0.26	See grading only below				
Mich.[7]	0.77	0.56	0.43	0.48	0.43	0.50	0.44	0.40	0.45	0.39	0.34	0.24	0.19	0.21	0.22	0.31[5]	0.43[5]	0.34[5]	0.25[5]	0.20[5]
Mo.	0.65	0.47	0.37	0.42	0.37	0.39	0.36	0.37	0.34	0.37	0.35	0.24	0.22	0.19	0.25	0.23	0.28	0.23	0.16	0.23
Nebr.	0.45	....	0.31	....	0.23	....	0.20	....	0.19	....	0.19	0.16	0.14	0.17	0.16	0.17	0.18	0.16	0.14	0.12
N. H.	....	1.55	1.16	1.81	1.40	....	1.36	1.20	1.06	0.90	0.63	0.40	0.37	0.57	0.58	0.46	0.58	0.65	0.44	0.37
N. J.	....	....	....	....	1.38	1.21	0.96	0.82	0.72	0.56	0.52	0.33	0.24	0.29	0.34	0.37	0.30	0.32	0.28	0.33
N. Dak.	....	....	....	....	....	....	0.30	0.31	....	0.25	....	0.17	0.14	.....	0.17	0.14	0.13	0.11	0.14	0.15
Ore.	0.50	0.66	0.39	0.41	0.40	0.31	0.36	0.36	0.34	0.30	0.29	0.25	0.27	0.27	0.28	0.24	0.21	0.20	0.17	0.17
R. I.	1.57	1.15	1.05	1.30	1.04	0.95	0.81	0.71	0.53	0.37	0.43	0.24	0.17	0.33	0.47	0.37	0.38	0.37	0.46	0.67
S. Car.	....	0.31	0.26	0.32	0.35	0.37	0.33	0.33	0.31	0.33	0.32	0.29	0.28	0.29	0.49	0.42	0.41	0.34	0.22	0.23
S. Dak.	0.58	0.46	0.22	0.27	0.26	0.22	0.21	0.21	0.23	0.20	0.20	0.17	0.14	0.18	0.18	0.17	0.21	0.17	0.11	0.10
Tex.	....	....	....	....	....	....	0.18	0.19	....	0.20	0.18	0.13	0.15	0.19	0.18	0.17	0.26	0.18	0.17	0.20
Utah	0.92	0.80	0.80	0.42	0.42	0.35	0.59	0.49	0.61	0.56	0.20	0.33	Changed to unclassified							
Vt.	1.39	1.61	1.65	1.22	1.20	1.28	1.20	1.16	1.12	0.76	0.78	0.52	0.34	0.54	0.58	0.65	0.59	0.38	0.31	0.30
Wash.	....	0.46	0.46	0.36	0.45	0.43	0.35	0.40	0.37	0.34	0.25	0.28	0.37	0.37	0.24	0.22	0.26	0.33	0.25	0.23
Wisc.	0.72	0.70	0.46	0.54	0.50	0.45	0.41	0.46	0.46	0.37	0.33	0.27	0.21	0.21	0.23	0.25	0.27	0.23	0.24	0.21

Notes: [1]Using Machines. [2]Hand Labor. [3]Grading—No surfacing. [4]Grading for pavement. [5]Earth Excav.—all contracts. [6]Grading for Surfacing. [7]Grading only.

EXCAVATION, UNCLASSIFIED—DOLLARS PER CUBIC YARD

Calif.	$1.10	$0.94	$0.71	$0.74	$0.75	$0.59	$0.44	$0.50	$0.56	$0.45	$0.42	$0.32	$0.28	$0.23	$0.27	$0.29	$0.42	$0.36	$0.29	$0.31
Colo.	....	....	....	....	....	....	0.68	0.28	0.40	0.68	0.41	0.26	0.20	0.23	0.27	0.22	0.56	0.28	0.23	0.31
Nev.	....	....	....	....	0.75	0.73	0.43	0.45	0.29	0.35	0.37	0.33	0.27	0.37	0.46	0.51	0.39	0.27	0.22	0.23
Pa. (Roadways Cl. I)	....	....	1.43	1.38	1.17	....	0.88	0.94	0.79	0.81	0.78	0.54	0.35	0.48	0.57	0.49	0.55	0.51	0.40	....
Pa. (Structures Cl. II)	....	....	....	....	....	....	1.35	1.63	1.61	1.67	1.78	1.34	1.04	1.13	1.40	1.43	1.65	1.79	1.48	....
Utah	....	....	....	....	....	....	....	....	....	....	....	....	0.22	0.43	0.39	0.31	0.33	0.23	0.29	0.18
Va. (Roadwy)	0.70	0.70	0.47	0.47	0.50	0.50	0.47	0.45	0.46	0.52	0.43	0.34	0.28	0.44	0.49	0.41	0.39	0.33	0.30	0.28

EXCAVATION, ROCK—DOLLARS PER CUBIC YARD

Ark.	....	....	....	....	....	$1.42	$1.50	$1.27	$1.17	$1.15	$0.86	$0.82	$0.53	$0.64	$0.74	$0.68	$0.22	$0.65	$0.64	$0.36
Colo.	....	$1.48	$1.21	$1.23	$0.94	0.97	1.13	1.28	0.93	0.86	0.85	Changed to Unclassified								
Conn.	$3.00	4.25	3.00	3.00	3.00	4.00	3.75	3.75	3.00	2.50	2.35	2.00	2.00	1.50	1.25	1.50	1.15	1.29	1.50	1.50
Del.	6.00	....	2.00	4.00	3.50	4.08	3.90	6.25	15.00	.....	2.00	1.08	1.75	2.38	4.15	4.00	1.75	.....	2.50	5.00
Ill.	3.40	2.39	1.72	1.83	1.26	0.78	0.69	0.82	0.64	0.75	0.53	0.39	0.43	1.47	0.94	1.33	2.83	1.11	1.23	1.29
Kans.	....	....	....	....	....	....	1.60	1.50	1.50	1.25	1.25	1.00	0.94	0.59	0.73	0.60	.....	.....	0.40	0.31
Me.	....	....	....	3.70	4.24	4.11	4.12	3.80	3.64	3.28	2.97	2.20	2.25	2.78	3.79	3.65	2.83	2.94	2.17	2.08
Mass.	....	....	....	....	3.84	2.99	2.02	2.33	3.00	2.46	2.53	1.60	1.03	0.98	1.87	1.71	1.46	1.35	1.00	0.89
Mich.	3.43	3.50	2.56	2.30	2.69	3.26	2.36	1.01	1.51	1.85	1.74	1.30	2.45	1.36	1.66	3.01	3.10	2.04	1.79	2.08
Mo.	2.21	2.20	1.85	1.81	1.71	1.69	1.69	1.56	1.42	1.47	1.34	0.98	0.81	0.82	0.69	0.82	0.77	0.62	0.40	0.70
N. H.	....	5.45	5.20	5.41	4.80	....	4.48	3.99	3.98	3.16	2.79	2.08	2.06	1.63	1.35	1.56	2.25	2.71	0.73	1.33
N. J.	....	....	....	....	5.55	4.19	3.64	2.84	3.31	2.04	2.36	1.96	0.42	1.00	1.16	.....	.....	1.53	.....	1.37
Ore.	1.41	1.17	0.99	1.09	0.98	0.99	0.70	0.79	0.78	0.87	0.82	0.84	0.50	0.60	0.55	0.60	0.54	0.56	0.47	0.58
R. I.	4.89	2.62	3.72	3.68	3.28	3.11	3.49	2.80	2.01	2.50	2.03	2.02	2.15	1.60	1.71	2.00	1.83	1.69	1.45	1.42
S. Dak.	....	....	....	1.08	1.18	1.02	0.97	0.97	0.90	0.79	1.12	0.84	0.75	0.47	0.78	0.76	0.76	0.80	.....	.....
Tex.	....	....	....	....	....	....	1.31	1.07	.....	1.06	0.98	0.59	0.41	0.87	0.81	0.74	.....	.....	.....	.....
Utah	1.85	1.82	1.82	1.72	1.72	1.27	1.26	1.12	1.35	1.18	0.80	0.88	Changed to Unclassified							
Vt.	5.19	5.45	4.75	3.34	3.68	4.81	3.91	2.98	3.22	2.46	2.80	3.51	1.06	1.54	2.02	1.95	1.66	1.51	1.69	1.32
Wash.	....	1.95	1.72	1.63	1.53	1.13	1.17	1.75	0.85	1.03	1.20	0.75	0.75	0.80	0.88	0.81	0.76	0.63	0.66	0.59
Wisc.	2.10	1.87	1.56	2.30	2.01	1.53	1.77	1.74	2.14	1.35	1.28	0.81	0.47	0.36	0.38	0.46	0.62	0.32	0.33	0.29

● Compiled by Engineering News-Record, this chart lists the average unit prices bid by contractors on state highway work. Note how the unit prices have been held down despite rising labor and material costs.

the Navy at any time, in which case the contractor will be paid for his costs to date and an equitable portion of the fee, while the government will assume all his outstanding obligations. If the termination is due to a fault of the contractor, the government may take his equipment, paying rental, to complete the job.

Grand Coulee Railroad Relocation

A million-dollar railroad relocation job will soon be under way in the State of Washington to make room for Grand Coulee Dam's 151-mile reservoir, according to the announcement of the Bureau of Reclamation which recently awarded a contract covering earthwork, structures and track for two branch lines of the Great Northern Railroad to J. A. Terteling and Sons of Boise, Idaho. The successful bid of $1,044,336.83, was the lowest of eleven proposals received.

Contract work includes the relocation of the Nelson and Republic branch lines, between Kettle Falls and Williams and Kettle Falls and Boyds. It involves the laying of more than 39 miles of track and the construction of necessary auxiliary structures, such as trestles, underpasses, culverts, and other minor structures. Included also are earthwork and structures for relocated highways adjacent to the railroad relocation. Railroad and highway bridges over the Columbia River near Kettle Falls, and the superstructures for the Kettle River Gorge bridges are to be taken care of in other contracts.

Rapidly rising waters in the new reservoir make it important that the work be completed on time. Work on the contract is already under way to meet the 275-day time limit.

Surry Mountain Dam Nears Completion

By Bethune Jones

Although the Ashuelot river flooded the workings for six weeks this spring, the Surry Mountain flood control dam is approximately 25 per cent completed, with 13 months to go before finishing date.

Workers on the million dollar project have a new respect for the tiny Ashuelot, Engineer Arnold MacSpaden of the federal engineers office reports. Now coursing calmly in the temporary bed dug for it during construction, the river looks anything but dangerous.

In March, however, the river rose a foot over the whole dam site, stayed from a foot to six feet above it until the first week of May. The 16-foot deep cutoff trench through the center, in which eight pumps were kept working continuously, was flooded out.

Work, however, went forward steadily in the 400-foot tunnel through which the river will flow when the dam is completed. All but a few feet of solid rock have been blasted through, and a connecting shaft has been cut up through the hill to the site of a control house.

The dam itself is slowly taking shape, foundations for each of the seven sections having been laid. Trucks are now hauling clay, earth and rocks to the site, where the materials are being tamped into place.

The core of the dam is being built of selected impervious earth, so heavy that it compares load for load with concrete. It, along with the other materials, is being cut from a nearby hillside, trucked to the dam and forced into place with scrapers and sheepsfoot rollers.

On either side of the core will be earth of a random impervious nature, not as heavy as the core. On either side of these sections will be pervious earth, and on the outside faces of the dam will

MY ADVICE IS . . .
USE EXCELLAY!
FROM THE DAILY REPORT OF A TIGER BRAND WIRE ROPE ENGINEER
I was just walking into Mr. Brown's office when one of his engineers called this morning.
"My advice to you," he said on the phone, "is use Excellay. No other rope can touch it. Next time the Tiger Brand Engineer comes in I'll have him see you. He's helped me out dozens of times."
Then he looked up and saw me "Well," he said, "speak of the devil and there he is." The three of us went over the specifications together, and decided that Brown was right — Excellay will do the best all-round job.
Yours,
Jim

KNOWING wire rope from A to Z—how to choose it and how to use it—that's the job of the American Tiger Brand Wire Rope Engineers. It will pay you to make use of their specialized knowledge and experience, gained through years of practical service to wire rope users in every industry, everywhere.

These men do more than help you select the right rope for a given application. If for any reason you are not getting full performance, they can help you locate the trouble and suggest practical ways and means for eliminating the difficulty. Get to know the American Tiger Brand Wire Rope Engineer who contacts you. Discuss your wire rope problems with him. Get his advice on every wire rope specification.

He can help you get a full dollar's worth of performance out of every dollar you invest in wire rope.

USS

EXCELLAY *Preformed* **WIRE ROPE**

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York

COLUMBIA STEEL COMPANY
San Francisco

United States Steel Export Company, New York

UNITED STATES STEEL

For your convenience in writing to United States Steel Corporation, Subsidiaries, you will find a card bound in this issue.

● Loaded in the tunnel by the shovel-equipped Cletrac tractor, this truck has been pushed to the diversion tunnel mouth at Indian Rock Dam, Pennsylvania.

be rock. At its base the dam will be 600 feet in width. It will slope to 30 feet at the top.

The project is scheduled to be finished in September, 1941.

WPA Approves $17,000,000 For Army, Navy Projects

Final approval of more than $17,000,000 in new WPA projects for construction work at Army and Navy posts in many parts of the country has been announced by Colonel F. C. Harrington, Commissioner of Work Projects.

Majority of the projects call for the construction or improvement of buildings, utility systems, roadways, rifle ranges and airplane landing fields in line with the rapid expansion of training facilities for the nation's armed forces. Included are 47 projects for the Army, located in 21 states and the District of Columbia, which call for expenditures of $7,260,653 of WPA funds, and 23 projects for the Navy, located in 14 states, the District of Columbia, Virgin Islands and Puerto Rico, with aggregate expenditures of $10,000,000 in WPA funds. The Coast Guard has a single project for improvements to its station near Baltimore at a cost of $118,639.

Tractor Solves Tunnel Problem

An unusual application of tractor power is the use of a Cletrac tractor with a Sargent Overhead shovel for mucking out a tunnel on a large Pennsylvania operation, at Indian Rock dam, York, Pennsylvania.

The Benjamin Foster Company of Philadelphia is cutting a water diversion tunnel through four hundred feet of rock ledge. Diameter of the tunnel is 18 feet, as blown. Each 300 pound blasting charge produces approximately 100 yards of blown rock. As soon as the powder fumes and excess dust have been removed by the ventilating fan, the tractor with ⅞-yard bucket Sargent Overhead shovel mounted on it, backs into the tunnel with a gasoline-powered truck towed behind the tractor. As the trucks are loaded they are pushed out by the Hercules diesel-powered Cletrac, since the use of gasoline truck motors in the tunnel is prohibited because of the danger of carbon monoxide.

Approximately 26¼ yards of material per hour is moved out of the tunnel, this includes pulling in the empty trucks and pushing out the loaded ones. The 4-yard trucks are loaded in four minutes.

Smallest "Cat" Skinner

Bolivar County, Mississippi, probably has the smallest working track-type tractor in existence—and very likely has the youngest tractor owner.

Three-and-one-half-year-old Marcus Ming, Jr., son of Marcus Ming, road superintendent for County District No. 3, is owner and operator of the 1½ horsepower model. Being something of a tractor fan, he got the small tractor as a present from his father, who operates a Caterpillar diesel D7.

The illustration shows Marcus Ming, Sr., on the county-owned D7 with his son driving his own machine alongside. The 1½ horsepower tractor isn't just a miniature, either, but is capable of producing some worthwhile work. Young Ming puts it to work on hauling jobs, pulling playmates' wagons here and there; and getting himself from place to place in a hurry.

Equipped with an electric starting motor and electric lights, the little tractor has a top speed of two miles an hour. Power comes from a single-cylinder gasoline engine, and the transmission is a miscellaneous assortment of gears. The rear axle was taken from a miniature automobile. Steering is done in the regular track-type manner; with clutches to stop the flow of power to the tracks. The tractor has both forward and reverse speeds.

Diversion Fight Continues

Taxpayers throughout the nation are joining in the fight to stop the practice of diverting highway funds. An active effort has started in Tennessee, where last year nearly $4,000,000 of road imposts were diverted for other purposes. North Carolina and Georgia are waging campaigns against diversion. High-

● Marcus Ming, Jr., pulls his 1½-horsepower tractor up alongside of his father's Caterpillar D7 on a road job in Bolivar County, Mississippi.

New— FASTER WAY OF EARTHMOVING..

MADE IN THREE SIZES, *with capacities ranging from 11 to 45 heaped yards. Illustration shows Model C Tournapull with LS (11 heaped yards) Carryall Scraper.*

THE TOURNAPULL METHOD

TAKES UP WHERE TRACTORS LEAVE OFF... EXTENDS LeTOURNEAU CARRYALL SAVINGS TO LONG HAULS

Tournapulls . . . newest thing in earthmoving . . . are designed to give you one-man earthmoving on long hauls. They combine in one fast-moving, self-propelled unit all the advantages of the job-proved LeTourneau Carryall Scraper and the world famous "Caterpillar" Diesel engine. They utilize the LeTourneau self-loading feature, which with a pusher eliminates the need for special loading equipment and cuts out waiting at the shovel. They haul tractor-size loads at truck speeds and spread their own loads, thus save you the need for spreading tools at the fill. No other equipment now on the market can deliver so much yardage so fast or so cheaply.

EASY, SAFE, SIMPLE TO OPERATE—*Same positive, quick-acting Power Control Unit that makes Carryall loading and spreading so simple with Tractors is used on Tournapulls. Shifting and steering differ but little from tractor operation.*

HAULS AT TRUCK SPEEDS—*Model C Tournapull speeding 11 heaped yards to the fill at 14 m.p.h. This Tournapull is one of four now working on a highway job in Upper Michigan on hauls of one-half to three miles one way.*

See for yourself what Tournapulls can do. Ask your LeTourneau dealer to show you how they extend Carryall savings to long hauls. See him NOW to assure yourself early delivery.

LETOURNEAU

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

For Lowest Net Cost per Yard - CARRYALL* SCRAPERS, ANGLEDOZERS*, CRANES, BULLDOZERS, POWER CONTROL UNITS, DRAG SCRAPERS, PUSHDOZERS, SHEEP'S FOOT ROLLERS, ROOTERS*, TREEDOZERS, TOURNAPULLS*, TOURNATRAILERS* *Name Reg. U. S. Pat. Off.

● Perched on mats, this Bucyrus-Erie 18-B dragline is building emergency dikes near Bataquez, Mexico, to replace banks that sunk during a recent earthquake.

way users, civic groups, trade associations—all are banding together in an attempt to end the practice.

Protest against diversion of highway funds in Iowa was registered in a resolution of the Iowa State Federation of Labor. At its annual convention the organization urged an amendment to the State Constitution to prevent diversion of highway revenues and urged that any increase in gas taxes be opposed.

In Utah, the State Road Commission is vigorously opposing diversion of State gasoline tax money. A recent survey by the State Educational Committee proposed that motor vehicle license fee money amounting to about $800,000 be diverted to the State general fund. Now Directors of the Municipal League of Utah have joined in the fight against the plan.

Rural letter carriers are actively fighting diversion. The Wisconsin Association has asked the 1941 legislature to approve submission of the anti-diversion amendment which was passed by the 1939 legislature. Illinois carriers passed a resolution condemning diversion.

Again New York State led all others in diversion. Over $75,000,000, more than three-fourths of the state's total road imposts, was diverted for other purposes. New Jersey diverted large sums to the general fund, and South Carolina diverted $2,000,000 for state government expenses.

● C. E. Bridges' Iowa soil stabilizing plant produces stabilized gravel, clay, and calcium chloride mix on a state highway job between Escanaba and Menominee, Michigan.

Continental Divide Tunnel Underway

Work will begin soon at the other end of the 13.1 mile Continental Divide Tunnel on the Colorado-Big Thompson project. Government authorities have already announced the awarding of a contract for the construction of a little more than a mile section beginning at the west portal to Platt Rogers, Inc., of Pueblo, Colorado, on their bid of $389,370, which was lowest of five proposals received.

The contract covers a 6,600-foot section, which involves the excavation of 31,400 cubic yards of materials, the furnishing and installing of 750,000 pounds of permanent steel tunnel supports, and some other work. Time allowed for the work will be 370 days.

This is the second contract awarded for construction work on the tunnel. The first contract for an 8,000-foot section at the east end was awarded in April of this year.

The tunnel is to be 9.75 feet in diameter inside the lining, 69,023 feet or 13.1 miles in length and lined throughout with concrete. It will extend from the east end of Grand Lake to Wind River, about 5 miles southwest of Estes Park. The west tunnel portal will be connected with Grand Lake by means of a channel 67.5 feet in width and 15 feet in depth. At the lake end of this channel a permanent concrete weir or barrier will be placed with a crest elevation at 8,367 feet above sea level, which will be the minimum elevation to which the water in Grand Lake can be drawn.

Water will be diverted through this tunnel from the upper Colorado River,

A YARD AND A HALF *that's a* MACHINE AND A HALF

Investigate the Bucyrus-Erie 37-B when you need an excavator that combines the speed necessary for big output with the toughness required to take heavy digging in its stride. Ask about the performance the 37-B has delivered on all kinds of jobs all over the world. Find out how oil-enclosed gears, anti-friction bearings, direct-action control, accessibility of machinery, and other Bucyrus-Erie features mean extra money for you. Study the 37-B and you'll agree it's the finest machine of size on the market. Don't take our word for it; find out for yourself.

Bucyrus·Erie

SOUTH MILWAUKEE, WISCONSIN

For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

on the Western Slope of the Continental Divide, to the headwaters of the Big Thompson River for use in supplementing irrigation supplies for 615,000 acres on the Eastern Slope in northeastern Colorado.

Pennsylvania Road Relocation

Cuts as deep as 80 feet and fill just as high in some places, were the big problems solved by the Harrison Construction Company in their Pennsylvania road relocation job between Johnstown and Southmont on the Ligonier-Johnston Highway.

About 272,000 cubic yards of material were handled by the company on the elimination and relocation of a steep, curving hillside road. Horizontal strata formations of shale and sandstone made the digging anything but easy.

Equipment used on the cut and fill operations consisted of two shovels, a Lorain 79 and a Koehring 801, two Tournapulls equipped with 30-yard Tournatrailers, two LeTourneau angledozers, three LeTourneau scrapers, one LeTourneau pushdozer, four Athey 14-yard wagons, and four Koehring Dumptors.

Because of the unusual job layout, a side hill road with occasional deep ravines cutting down the mountain sides, the contractor was unable to set up a complete system of cut and fill balances. Considerable material had to be borrowed and hauled several thousand feet.

One of the most interesting cuts and fills on the job involved a deep cut on one side of the road and a fill with a retaining wall on the other. Working on a 42-foot road bed, Harrison Company had an 8-foot cut down to grade on the center line, involving considerable smart side hill 'dozer work on the part of the operators. On the opposite side of the road, a 15-foot retaining wall was built to support the road bed fill.

Because of the necessary great distances between cuts and fills, hauls averaged 2,700 feet one way. At the north end of the contract, where there were 100,000 cubic yards of excavation, the haul was 4,300 feet by the stationing up grades ranging from 3 to 6%.

● A Koehring 801 loads to a 30-yard Tournatrailer on a Pennsylvania road contract held by the Harrison Construction Company of Pittsburgh.

The fast operating ability of modern equipment enabled the contractor to average the following working cycle:

Loading 5.0 minutes
Hauling 11.0 minutes
Dumping .2 minutes
Turns and Spotting 2.0 minutes
Return 2.6 minutes
Total for complete cycle 20.8 minutes

This time does not include any waiting time at the shovel.

Harper Appointed Chief Engineer

Secretary of the Interior Harold L. Ickes has announced the appointment of Sinclair O. Harper as chief engineer of the Bureau of Reclamation.

Mr. Harper, the Bureau's assistant chief engineer in the Denver office of the Bureau since 1930, has been acting chief engineer since the death of Raymond F. Walter (See page 482, Excavating Engineer for August, 1940) on July 1 at Fresno, California, during a visit to Friant dam.

Commissioner of Reclamation John C. Page expressed satisfaction with the appointment. "I recommended Mr. Harper to the Secretary as the best available appointee for this important job. He has ably carried the full responsibility of the Denver office during Mr. Walter's absences from the office, and has always been the Chief Engineer's right hand man. He has been with the Bureau for 33 years and has a thorough knowledge of irrigation construction. He is a sound engineer and a good administrator."

Mr. Harper is the Bureau of Reclamation's fifth chief engineer in the 38 years since Congress established it on

A Haiss Bucket is a Crane Man's Delight
Power to grab and "rassel" a boulder out of sticky clay.... Power to dig in any ground.... Power in its closing gear, power in its jaws and teeth, power in its Haiss-design. Write or wire for prices. All sizes.
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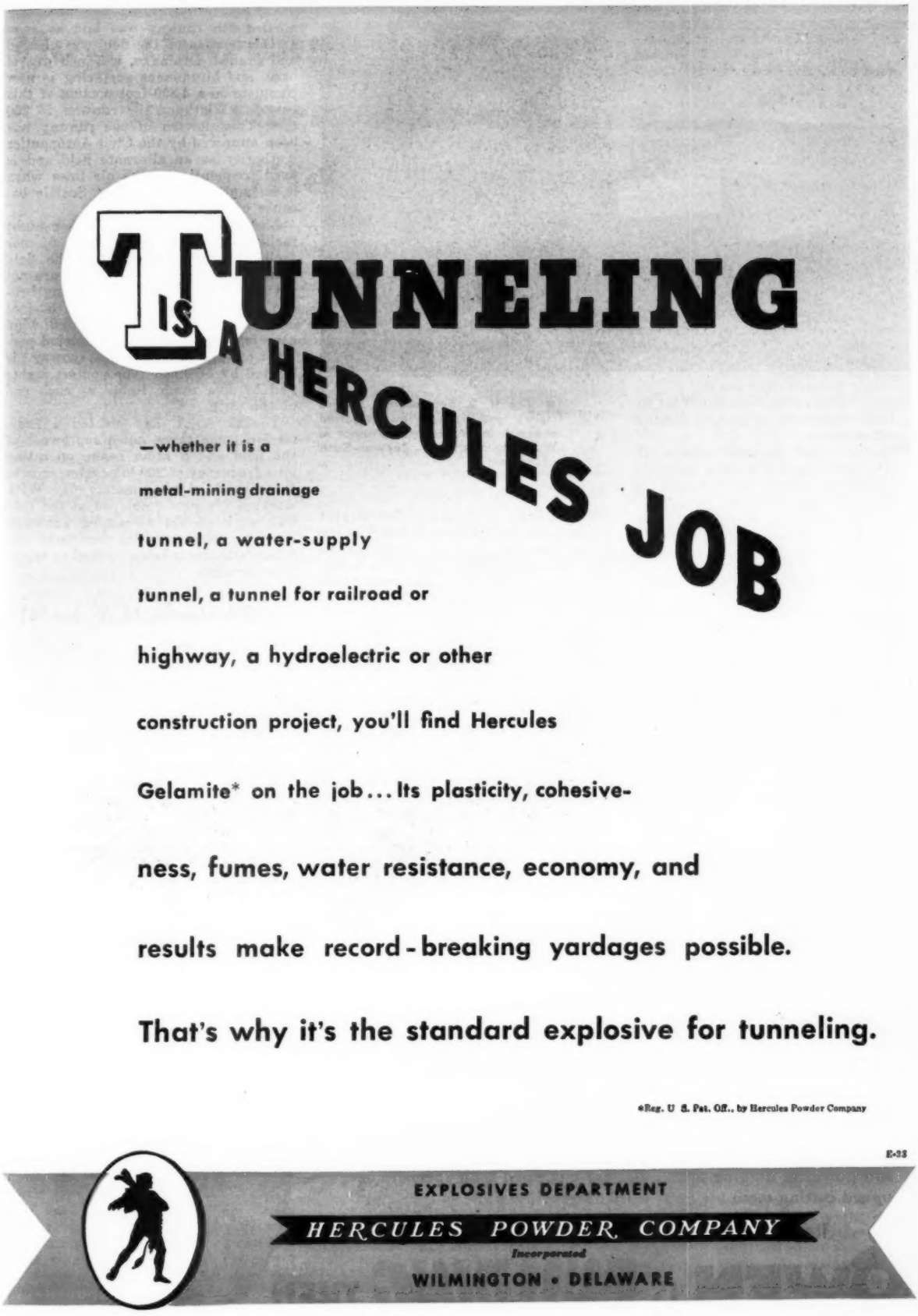


For your convenience in writing to Hercules Powder Company, you will find a card bound in this issue.

● The U. S. Reclamation Service cleans and deepens an irrigation channel on the Riverton Project in Wyoming with a Bucyrus-Ruth excavator.

June 17, 1902, to develop the West by the construction of irrigation systems in arid regions.

The first Chief Engineer was F. H. Newell, who served in that capacity until 1907 and then later served as Director. He was followed by: A. P. Davis, 1907-20; F. E. Weymouth, 1920-25; and R. F. Walter, 1925 to 1940.

WPA County Airport Job

Strategic Snohomish County Airport in Washington state offers a good example of the problems involved in modern airport construction. This airport which is another link in the chain of military and commercially important airports of the Pacific Northwest is now being rushed to completion by the WPA.

The site of this undertaking is some 20 miles north of Seattle and about eight miles southwest of Everett. The airport is located on a ridge 576 feet above sea level. This places it above all major land obstructions in the vicinity and above most fogs. The excellent year-round visibility that is attained is one of its many advantages. Since 1937, a visibility of less than 500 feet has been observed for only two per cent of the time; while a visibility of over ten miles has been possible for 62 per cent of the time during this period.

The task of clearing and grubbing the 680-acre tract of land for this airport was a large undertaking in itself as the tract averaged about 80 stumps to the acre. Between 300 and 400 WPA workers were given employment on these operations and to date nearly 500 acres have been cleared and grubbed and 2½ million cubic yards of material have been moved in excavating and leveling operations. About a million cubic yards of material is yet to be moved to complete the excavation for the four runways.

The machinery used in these clearing and grading operations included scrapers, tractors, bulldozers and 1¼ and 1½ cubic yard shovels. Due to the long hauls of surplus excavated material involved and to the presence of an old industrial railroad, now government owned, the material was moved by rail. Five 20-ton steel locomotives and fifty-one 6-cubic yard railway dump cars were used for this purpose. Considerable saving was attained by firing the locomotives with wood fuel salvaged from the clearing operations.

In order to prepare the field of emergency landings as soon as possible, the north-south runway was laid as soon as this portion of the field was cleared and graded. Drainage, a 5-inch gravel base, and bituminous surfacing is now complete on a 4,800-foot portion of this runway. Width of the runway is 200 feet. This portion of the runway has been approved by the Civil Aeronautics Authority as an alternate field and is used frequently by the air lines when it is impossible to land at Seattle because of fog.

Lighting equipment and other flight facilities have been installed to further facilitate emergency use of the field even though the other runways are not yet complete. A 24-inch revolving beacon has been installed on a 50-foot emergency tower and a lighted wind cone is also in use. The completed portion of the north-south runway is lighted by 55 flush type contact lights and by five range lights at each end of the strip.

The C. A. A. has erected a radio station some three miles southwest of the field and a radio beam, operating on a frequency of 209 kilocycles, crosses the airport. Approximately 650 WPA workers are now employed at the field and work on the remaining runways, hangars, administration buildings and other facilities is being pushed as rapidly as possible.

ARBA Names N. Y. for '41

"Roads for Defense" will theme note the 1941 Convention of the American Road Builders' Association. Outstanding military authorities and representatives of the U. S. War Department will participate in an open forum on military roads during the four-day conclave in New York City, January 27-30. The role of highways in America's preparedness program and the changes needed to make the nation's highway system meet the demands of modern warfare will be emphasized in convention sessions.

Inspection trips to the newest of modern construction projects in New York's metropolitan area are planned by Robert W. Moses, commissioner of the city department of parks. His department is arranging for convention delegates to visit parkways, tunnels,

BETTER TRENCHING BUCKETS are being built . . .

SPECIAL jobs often require special tools and while Owen Buckets are conceded to be unusually versatile in digging, the trenching buckets not only combine the requisite features of correct principle and powerful digging ability but are equipped with specially designed cutting teeth for most efficient trench work.

AND The OWEN BUCKET CO. 6095 BREAKWATER AVE. CLEVELAND, OHIO BRANCHES: New York, Philadelphia, Chicago, Berkeley, Calif.

OWEN IS BUILDING THEM

For your convenience in writing to The Owen Bucket Co., you will find a card bound in this issue.

How thorough lubrication lengthens the service life of wire rope

This is No. 5 in a series of informative articles for Wire Rope users prepared by the Macwhyte Wire Rope Company.

The importance of thorough Wire Rope lubrication in obtaining safe and economical service cannot be overestimated.

Wire Rope is a complicated piece of machinery. A 6 x 19 rope, for instance, is made up of 114 wires plus a core (which may be hemp, or an independent wire rope center).

As the rope bends over sheaves and drums the wires continually move and rub against each other. Each wire becomes a bearing surface that grinds and wears against other wires—unless all are properly lubricated.

Proper lubrication is just as important to wires in your rope as it is to gears in your car.

Two Lubricating Methods

1. Internal Lubrication. A most effective internal lubrication has been pioneered by Macwhyte. During the rope's manufacture each wire is thoroughly covered, spaces between wires completely filled, with a special lubricant. This compound does not dry or flake off in extreme cold. It does not melt or run under summer heat.* This special lubricant protects against internal friction and corrosion.

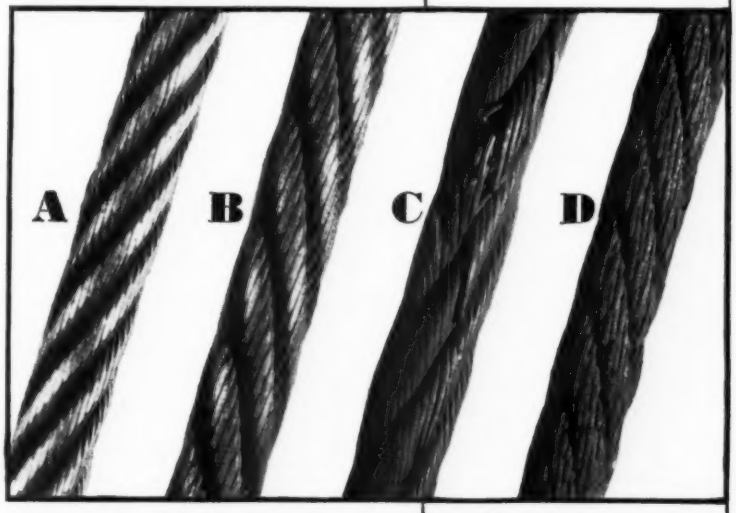
2. External lubrication, applied on the job, acts to seal in the internal lubrication. It also guards external wires against corrosion and reduces abrasion.

CONCLUSION: If a wire rope user wants the greatest possible service from wire rope, it is wise to buy a rope which is internally lubricated during manufacture (not all ropes are). No external applications applied later can possibly reach the inside wires where it is needed most.

Engineering Service

Use Macwhyte Engineering Service—a wire rope or lubrication recommendation may save you many dollars. It's a part of our friendly service to help you get the most from your wire rope dollar.

*For complete information ask for interesting folder, "The WHY IN MACWHYTE Internal Lubrication."



MACWHYTE COMPANY
2940 Fourteenth Avenue, Kenosha, Wisconsin
Manufacturers of Rope Wire—Braided Wire Rope Slings—Monel Metal Wire Rope—Stainless Steel Wire Rope—Cable, Tie-Rods, and "Safe-Lock" Terminals for Aircraft; Wire Ropes for all industrial requirements.

SO. 481

FROM THE FIELD

A This rope contains Macwhyte's Special Internal Lubrication. External lubrication was applied periodically during service. *Result:* Uniform wear, maximum service.

B This rope was internally and externally lubricated with Macwhyte's Special Lubricant during fabrication. It was never externally lubricated in service, however. *Result:* efficient service, but had to be removed prematurely because exposed outer wire became rusty. When removed from job inner wires were still in good condition and well lubricated—indicating that external application of a good lubricant would have prolonged rope life.

C No internal or external lubrication was applied to rope "C." Strands and wires became frozen, which eliminated freedom of wire and strand movement when the rope flexed over sheaves. *Result:* Premature rope failure before wires had received normal wear.

D An idle rope should always be kept lubricated. Rope "D" was removed from service and stored for future use. Not being protected, however, rust and corrosion set in and ruined the rope. *Result:* unnecessary waste and high rope cost that lubrication could have prevented.

MACWHYTE
Whyte Strand
PREformed WIRE ROPE
The Wire Rope with THE Internal Lubrication

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For your convenience in writing to Macwhyte Company, you will find a card bound in this issue.

● Air view of Canada's new 4-lane superhighway between Fort Erie and Toronto showing one of the cloverleaves on the 91-mile Queen Elizabeth Way.

elevated highways, bridges and numerous other public works. The New Jersey State Highway Department is arranging similar trips and the New York City engineer's office has also offered the Road Builders its fullest cooperation. A special trip to LaGuardia Airport will be a convention highlight.

An open forum on the highway industry's public relations problems is to be sponsored by the association's public relations division. The convention will also be the occasion for the first session of the new highway economics division. Convention headquarters are to be established at the Pennsylvania hotel, and the annual banquet will be staged at the Waldorf-Astoria, January 29.

Canada's New Superhighway

Canada's first dual-lane express highway, the Queen Elizabeth Way, a non-toll road, is nearing completion in Ontario between Fort Erie and Toronto. The entire 91-mile route when finished will connect with the new Rainbow Bridge at Niagara Falls.

Traffic in each direction will have an independent 23-foot highway. The exceptionally wide right of way, 300 feet for the most part, allows a parkway between opposing lines as wide as 50 feet. All major exits and entrances will be accomplished by full or semi-cloverleaves. All congested centers will be by-passed. Even the smallest of the township and farm entries will be lighted at night. For stretches averaging ten miles the road is straight as a die, and while the old road between Toronto and Hamilton had 140 curves, the new highway on the same stretch will have only 23 and none of them greater than two degrees. Total cost of the highway will reach $11,000,000.

Quebec Awards Road Contracts

The Minister of Highways for the Province of Quebec, Canada has just announced in the Montreal Gazette the letting of contracts on 110 miles of highways, amounting to $1,316,135. Contracts were awarded to the following:

Modern Paving, Ltd., Montreal, contract for $99,842.

Cie de Rimouski & Gaspe, Inc., Rimouski, Que., contract for $161,525.

Local Construction Co., Ltd., Montreal, contract for $68,202.

Regional Contruction Co., Hemmingford, Que., contract for $107,092.

Montmorency Construction Regd., Montmorency Village, Que., $102,440.

Dave Devito, Meauville, Que., contract for $107,459.

Celestin Fimard., Quebec City, Que., contract for $95,904.

Page Equipment & Construction Co., Three Rivers, Que., contract for $25,240.

H. J. O'Connell, Ltd., Montreal, contract for $275,302.

Samuel Lafontaine, Napanee, contract for $47,034.

Cytrien & Gagnon, Neuville, contract for $14,575.

Page Construction Co., Qubec City, Que., contract for $3,645.

Provincial Construction Co., Montreal, contract for $13,584.

Start Final Stage of Marshall Ford Dam

The final stage of constructing Marshall Ford Dam, that of completing a high flood-control and power dam on the Colorado River project, Texas, was provided for in two contracts amounting to more than $4,000,000 awarded by the Bureau of Reclamation.

One contract, covering the completion of the concrete section of the dam, was awarded to Brown & Root, Inc., and McKenzie Construction Company of Austin, Texas, on their low bid of $3,137,495. This contract involves the placing of 464,000 cubic yards of concrete and 1,332,000 pounds of reinforcement bars, in addition to other work, including the construction of an elevator tower, the installation of trashrack metalwork, doors and windows. Work in the contract must be completed within 525 days after date of receipt of notice to begin construction.

The other contract, covering excavation and earth embankments, was awarded to the Cage Bros. and W. W. Vann and Company of Bishop, Texas, on a low bid of $903,102. This work involves the excavation of more than 2,800,000 cubic yards of material for embankments, drains, roads and parking areas, and the placing of more than 1,500,000 cubic yards of earth, gravel

3 LEADERS CO-OPERATE in building modern bridges

KNOWLEDGE possessed by the Van Haarens and facilities afforded by their Rogers Trailers permit the Mahon organization to fabricate large girders at their local plant and haul them to points distant from Detroit.

A majority of the better movers throughout the country and in several foreign lands depend upon Rogers Trailers for their heavy and unusual operations. You, too, will find in them a combination of the practical features that assure profitable operation.

Write for Literature
ROGERS BROS. CORP.
136 Orchard St. Albion, Pa.

EXPERIENCE built it PERFORMANCE sold it

For your convenience in writing to Rogers Brothers Corporation, you will find a card bound in this issue.

and rock fill in embankments. The work must be completed within 450 days.

Marshall Ford Dam is the major flood-control unit of the Colorado River of Texas project, located about 12 miles northwest of Austin. The dam is being constructed in two stages. The first stage, that of constructing a low dam and power house, is complete, the dam being constructed by the Bureau of Reclamation and the power house by the Lower Colorado River Authority. Prior to completion of the low dam, however, the Congress in 1938 appropriated $5,000,000 to continue the work, looking toward completion of a high flood-control dam, the second stage, without interruption. To provide for commencement of the high dam, a change order was approved for Brown & Root, Inc. and McKenzie Construction Company, the contractors for the low dam, to widen the base of the low dam and bring the full base of the dam to elevations approximately the same as the crest elevations of the low dam. This work is now virtually completed, thus making ready a foundation for raising the entire dam.

The two contracts just announced provide for the second stage of construction, raising the dam to a height of 270 feet above foundation, or more than 70 feet higher than the low dam, and increasing the length of the crest from 2,302 to 2,623 feet. The rolled earth embankment, flanking the concrete section on the left abutment, will be increased in height from 35 to 105 feet and increased in crest length from 1,100 to 2,500 feet. The earth embankment will be protected by a rock face on both the upstream and downstream slopes. The spillway section, located in the river channel will have an effective length of 700 feet.

By enlarging the dam a reservoir of 3,120,000 acre-foot capacity will be provided to be used jointly for flood control, power, and river regulation to augment the low water flow for irrigation purposes along the Colorado River below Austin. This high dam is considered essential to adequate control of the river, a particularly dangerous stream, subject to quick floods of great heights.

Of the series of structures comprising the Colorado River of Texas flood-control and power project, only Marshall Ford Dam, the principal unit, is under the jurisdiction of the Bureau of Reclamation. The other units are under the jurisdiction of the Lower Colorado River Authority, a Texas agency.

Ohio Spends $1,586,362 For Roads

Contracts for $1,586,362 in road construction and resurfacing has been awarded by the Ohio department of highways, following project sales in Columbus.

Robert S. Beightler, director of the highway department, announced that the projects were in 26 counties.

The largest of the projects is in Belmont county and involves the expenditure of $543,409, and the second largest is in Darke and Miami counties, where the expenditure will be $380,006.

Venezuela Roads Built With U. S. Equipment

Expenditures for construction and maintenance of Venezuela highways in 1937-38 were reported at about $5,000,000 and the budget for the fiscal year ending June 30, 1939, at slightly more than this amount. United States manufacturers supply practically the entire Venezuelan requirements for road-building and allied machinery.

OBITUARIES

Frederick J. Bodinson Edmund T. Kelly

News of the sudden, accidental death of Frederick J. Bodinson and Edmund T. Kelly comes as a shock to their many friends in the excavating industry. Mr. Bodinson was president and Mr. Kelly vice-president of the Bodinson Manufacturing Company of San Francisco, the largest builder of dragline dredge and drybank washing plant

For your convenience in writing to Gatke Corporation, Inc., you will find a card bound in this issue.

equipment for the recovery of placer gold, in the world.

Both men were killed on July 12, when their automobile overturned near Jordan Valley, Oregon, while they were on a business trip to Idaho.

Mr. Bodinson and Mr. Kelly were two of the most widely known and loved men in their industry. Hundreds of friends attended the double funeral services that were held in San Francisco on July 17, and paid their final respects to the memory of the two men who had contributed so much valuable scientific and practical knowledge to the mining industry.

Fred W. Bodinson, son of the late Frederick J. Bodinson, has succeeded his father as president, and Edmund B. Kelly, son of the late Edmund T. Kelly, has succeeded his father as vice-president of the Bodinson Company.

Robert S. Campbell

Robert Samuel Campbell, 51, president of Campbell Limestone Company, operating quarries at Gaffney and Liberty, South Carolina, died of a heart attack July 17, while visiting in Cowpens, South Carolina.

Mr. Campbell was a son of the late Dr. H. L. Campbell of Strawberry Plains, where he was born and reared. He received his education at Carson-Newman and Milligan Colleges.

He had made his home in Knoxville, Tennesee, for the last 16 years.

Surviving are his widow, Mrs. Tula Sims Campbell of Knoxville; one son, Robert S. Campbell of Gaffney, South Carolina; his mother, Mrs. H. L. Campbell of Strawberry Plains; three sisters, Mrs. George Loy, Mrs. John Grubbs, Strawberry Plains and Mrs. W. R. Anderson of Hattiesburg, Mississippi.

George Copp Warren

George Copp Warren, 76, a director and former president of Warren Brothers Company, Cambridge, Massachusetts, one of the world's largest highway construction firms, died July 31 at his summer home in Greenbush, Massachusetts. He was a resident of Brookline, Massachusetts.

A native of West Newton, Massachusetts, Mr. Warren became a clerk in the Warren Chemical Manufacturing Company, an asphalt refining concern owned by his father and his uncles, when he was 17 years old. In 1884 he became a foreman of the Warren-Scharf Asphalt Paving Company in Utica, New York, and by 1895 he was general superintendent.

At the turn of the century he joined with his six brothers in founding the Warren Brothers Company, which has built roads and streets in all parts of the United States and in Canada and many other foreign countries. A new type of bituminous pavement, known as the bithulithic, invented by one of the brothers, Frederick J. Warren, was developed by the company and is now in general use in cities of the United States and Canada. Mr. Warren became president of the company in 1905 on the death of Frederick J. Warren, and at various times also had served as vice president, general manager and chairman of the board of directors.

Mr. Warren was long an advocate of the construction of footpaths and sidewalks along highways. He observed that thousands of pedestrians were killed or injured each year because there was no other place for them to walk except on the highways. He was chairman of the highway sidewalks committee of the American Society of Municipal Engineers. In his work of promoting highway sidewalks he was assisted by his wife, the former Francis Vaughan Gibbens, who died in 1934.

A member of the American Road Builders Association and the American Public Works Association, Mr. Warren was author of many brochures on highway construction practice.

Surviving are four children, Herbert M. Warren of Atlanta, Georgia; Mrs. Harold W. Wise of Beverly Farms, Massachusetts; Lewis G. Warren of Brookline, and Mrs. Schuyler Dillon of Norwell, Massachusetts; a brother, Ralph L. Warren of West Newton, Massachusetts, and seven grandchildren.

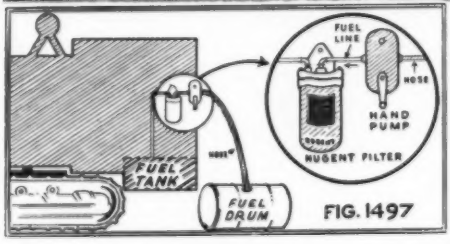


FIG. 1497

A New-Positive Method for Stopping Diesel Fuel Oil "DIRT TROUBLE"

EXPERIENCE has proved that dirt in Diesel fuel lines is one of the chief difficulties encountered wherever earth moving equipment is used — and one of the reasons why dirt gets into fuel is the way it is handled in filling the fuel tank for the day's operation. Now you can stop dirt, fabric from hoses, etc., *before* it ever gets into the fuel tank — by installing a Nugent Fuel Oil Filter in the line between the hand pump and the fuel tank. (See diagram at the left.) Installation is extremely easy.

Don't confuse Nugent Fuel Oil Filters with ordinary filters. Their patented construction gives you up to 20 times more actual filtering area than most filters of comparable size. This means very low oil flow velocity through filter . . . longer intervals between cleaning . . . less maintenance . . . less labor expense. Nugent's special woven, acid resisting, *lintless* textile filter element removes particles as small as .0003" to produce 99-8/10% clean oil. Mail the coupon today for full particulars.

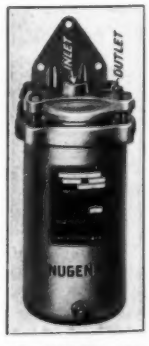


Fig. 1118 TZ—1R

WM. W. NUGENT & CO.
427 N. Hermitage Ave., Chicago, Ill.

Please send me literature and information about Nugent Fuel Oil Filters for Diesel Engines in earth moving equipment.

Name .....
Company .....
Address .....

Wm. W. Nugent & Co., Inc., Mfrs.

Oil Filters, Oiling and Filtering Systems, Telescopic Oilers, Oiling Devices, Sight Feed Valves, Flow Indicators, Compression Union Fittings, Oil Pumps, etc.

Established 1897

427 N. Hermitage Ave. CHICAGO, U. S. A.

When writing to Wm. W. Nugent & Co., Inc., Mfrs., use coupon or card bound in this issue.

New Equipment

(Continued from page 524)

continually subjected to unusual wet and muddy conditions. The suit is said to be roomy, comfortable and waterproof. It is especially suitable for use in quarries, tunnels, coal and metal mines.

The M.S.A. miner's protection suit consists of two pieces—a jacket and overalls. Both pieces are of black rubber, friction-coated on a strong, special rubber-impregnated fabric base. All seams are stitched, strapped and cemented, with rivets at points of tension. This suit is available in three sizes.

Further information on the M.S.A. miner's protection suit may be obtained by writing to Mine Safety Appliances Company, Braddock, Thomas & Meade Streets, Pittsburgh, Pennsylvania.

Rogers Trailer

Art Brockman, contractors equipment mover of Detroit, Michigan, was recently confronted with the task of moving an 87½ ton press head for a big automobile manufacturer. His largest trailer was a Rogers Model D-50-D 50 ton Drop-Deck job. A

reinforcement of the main trailer beams at the recommendation of Rogers Bros., enabled Mr. Brockman to satisfactorily load and haul a combined weight of over 90 tons on this size trailer.

Tournapull Tire Chains

Pennsylvania's record-breaking highway projects of 1940—of which the Turnpike is the most famous example—include others in which equally original engineering ideas are having their first tryout.

One of these is the application of tire chains to the largest tires ever built. The problem involved traction, and even more, protection to the huge tires costing about $2500 each. The footing was sharp, rocky and uneven. Called into consultation, the American Chain & Cable Company recommended a chain link armor or protective web of welded chain which

covered almost the entire tread surface.

The Tournapull illustrated, equipped with a 160-horsepower engine, not only concentrates its entire weight and tractive stresses on the two pneumatic tires, the largest ever built, but in addition shoulders its share of 30-yard loads. Speeds range up to 21 miles an hour.

Single Control Lever

The Buckeye Traction Ditcher Co., Findlay, Ohio, announced that their model 50, ½ yd., model 60, ⅝ yd., and model 70, ¾ yd. Buckeye Clipper shovels feature a single lever for controlling both hoist and dipper trip operations, making it unnecessary for the operator to reach for a second lever to dump the dipper load.

These operations and all other actions in the working cycle—swing, crowd, travel and boom hoist — are vacuum controlled, through the patented Mevac system, the original vacuum control developed by Buckeye engineers. Six toggle levers control all operations.

The maker claims that in addition to the speed provided by eliminating the lost motion of shifting long levers, the Mevac vacuum control system eliminates condensation, moisture and freezing trouble and is not affected by temperature or climatic conditions. More details may be obtained by writing the Buckeye Traction Ditcher Company.

Brooks
LOAD LUGGER
hits the bull's-eye

. . . if you are aiming for the fastest method and lowest cost of moving materials on excavation, construction, quarry work, road building and similar jobs where *loading is done by hand.*

It's so simple! Just spot the buckets handy for the men to fill . . . using several buckets for each crew . . . then pick them up as fast as loaded, hauling and dumping with a Brooks LOAD LUGGER. It can be mounted on any standard truck chassis and operated by one man.

You save on equipment expense . . . handle more yardage . . . and cut your costs 50% or more.

Write for this Bulletin

You can prove the economy of the Brooks LOAD LUGGER on your own operations by taking advantage of our Special Introductory Offer . . . ask us for details.

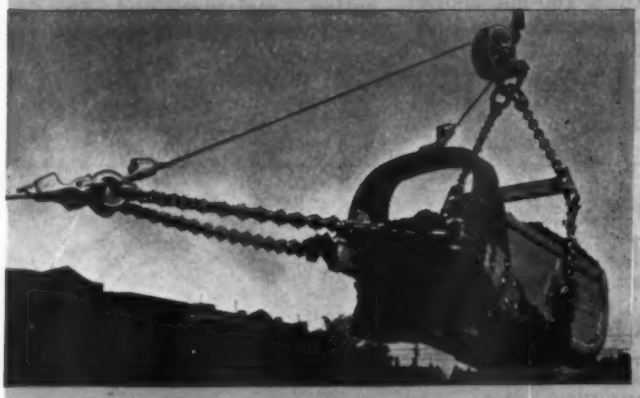
BROOKS EQUIPMENT & MFG. CO.
Knoxville 109 Davenport Road Tennessee
Distributors in all Principal Cities

For your convenience in writing to Brooks Equipment & Manufacturing Co., you will find a card bound in this issue.

Here's why

RED ARCH BUCKETS

mean bigger output for you



YOU get big output with modern Bucyrus-Erie Red Arch buckets because they are streamlined for speed. Strong all-welded construction means minimum weight to lift and swing on every cycle, and that means more cycles per hour and more output per day. You get more dirt on every pass, too, with these outstanding buckets. Exclusive Beco Tiger Teeth bite into the digging in just the right way to get a heaping load in the shortest time. The pitch and shape of the Tiger Teeth, the location of the drag hitches with respect to the teeth, the location of the center of gravity of the bucket, the sharp cutting edge between teeth, all these are correctly balanced to give you high-speed digging. Proper weight distribution, placement of arch and hoist chains give a bucket that rides easily during fast swinging. The smooth curved interior of the bucket and the height of the arch give free quick dumping of even sticky material.

You don't waste time with Red Arch buckets. Operating time is spent actually moving dirt. Notice that the inserted forged-steel teeth have sufficient metal so they can be sharpened by reforging as well as by welding. These teeth are the easiest to remove and replace of any on the market. Their efficiency means real added output for you. These modern buckets are furnished with exclusive Red Arch incandescent butt-welded chain which gives up to 50 per cent longer life than ordinary chain.

Red Arch buckets are built in three types, for light, medium and heavy digging. Sizes range from ⅜ to 20 yards. Write today for full information on the size and type you need.

Bucyrus-Erie Co.

SOUTH MILWAUKEE, WISCONSIN

BUCYRUS ERIE

For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

Last Will and Testament

The unknown contractor who filed the following last will and testament couldn't have arrived at a more suitable distribution.

"Fix it so my overdraft in the First National goes to my wife—she can explain it to them.

"Give my equity in my automobile to my son. He will have to go to work then to meet the payments.

"Give my unpaid bills to the bonding company; they took some awful chances on me and are entitled to something.

"That new-fangled machine on the job I want the resident engineer to have. He made me buy it. Maybe he can make it work.

"Return plans to the architect. I never understood them either.

"My retained percentage, give to the State. I never expected it anyway.

"My equipment—give to the junk man. He has had his eyes on it for years.

"I want you to handle the funeral for me, Judge. Any undertaker will do, but I want these six material men for pallbearers. They have carried me so long they might as well finish the job."

Shovelrunner Ike sez—"Marriage is like boxing. Preliminaries often better than main event."

A Pennsylvania contractor contributes the one about the shovelrunner and two inspectors who were invited by the boss to have a drink. Stepping up to the bar the boss said to the bartender, "I'll have 4-Kings."

"Make mine Three Rivers," ordered one inspector.

"I'll take Four Roses," said inspector No. 2.

"Oh, hell," piped the nonchalant shovelrunner, "let me have 4 Overholts.

Shovelrunner Ike sez, "Old maids are born not made."

A society member approached Henry, "We are having a raffle for a poor widow," she said. "Will you buy a ticket?"

"Nope," said Henry. "My wife wouldn't let me keep her if I won."

"Boy, is my girl mad at me!"

"What's the matter?"

"I told her that her bustle was slipping."

"Why, that shouldn't have made her mad."

"Yeah, but she didn't have one on."

NOT in the *Contract*

Shovelrunner Ike sez—"Indian girl have plenty fun with beau and error."

Penitent Motorist: "I'm sorry I ran over your hen, would a half dollar make it all right?"

Agrarian: "Better make it a dollar, mister. I've got a rooster that's very fond of that hen and the shock might kill him."

An Irishman visited a tuberculosis exhibit, where lungs in both healthy and diseased conditions were displayed preserved in glass jars. After carefully studying one marked "Cured tuberculosis lung," he turned to the physician and said:

"Perhaps it's because Oi'm Irish, but if ye cured th' patient, how could ye have his lung in a bottle?"

"You say this woman shot her husband with this pistol and at close range?" asked the coroner of the eye witness to the colored tragedy.

"Yassuh."

"Are there powder marks on his body?"

"Yassuh. Dass why she shot him."

Statisticians have figured out that at the age of 85 there are seven women for every four men, but of course, by that time it's too late.

On clothes she spends her legal tender;
Because this truth she's found—
A dress can make a girl look slender,
And a hundred men look 'round.

Shovelrunner Ike sez—"Girl who use bust developer try to make mountain of mole hill."

A middle-aged woman lost her balance and fell out of a window into a garbage can.

A passing Chinaman remarked: "Mellicans velly wasteful; that woman good for ten years yet."

A small boy was asked by his father, a well-known contractor, what he would like for Christmas.

"A baby sister," replied the boy.

"But it's only two weeks to Christmas and that doesn't leave much time," said his father.

"I know, father," answered the child, "but can't you put more men on the job?"

". . . and right over there is one of our famous developments."

Soil-Cement

(Continued from page 515)

superintendent the surface is watered down and huge cotton mats are used to cover the newly laid surface of the road. These mats are left in place for at least twenty-four hours.

When the mats are removed, the surface is next covered with a thin layer of RC_2 cut-back asphalt. This is applied with a pressure distributor. The requirements are that it be applied at the rate of .2 of gallon per square yard.

For a minimum of 28 days the base is left alone. No traffic is allowed on the road until the last of the curing process is completed. Upon completion of the 28 days a double asphalt surface treatment (O. A. 135) is laid. When this surface, or topping, is completed the road will be open to traffic. The mix is now running 80 tons to the hundred feet. At the rate of 1500 to 1800 feet of paving per day the contractors are running pretty close to schedule.

Trucking work on the contract is sub-let to the Tullose Truck Company who have a fleet of Fords on the job.

● Complete compaction of the soil-cement mix is facilitated through the use of this Farmall-towed harrow-scraper.

In the last year and a half Heldenfels Brothers have completed 18 to 20 contracts, totaling well over a million and a half dollars.

J. W. Puckett, district engineer, and W. J. Apperson, resident engineer, represent the Texas State Highway Department on the Kennedy County contract.

Ready for Winter

(Continued from page 517)

pillar-mounted machine can be transported on standard railroad flat cars was one of the contributing factors in the decision to use the dragline and shovel for the job. The ability of the dragline to climb banks and move from position to position readily, proved to be superior in daily yardage produced to the shovel. The factor involved on this particular maintenance of way excavating operation, was the long reach of the dragline boom, permitting dumping at long range. The strength of the machine and cable was sufficient to move the material without the use of explosives, an important factor in the saving of man-hours and machine time.

Casting for Coal

(Continued from page 520)

of the overburden to be handled composed of unblasted rock. The coal itself is no soft digging. Average output per 7-hour shift is 1,000 yards for the 54-B, and 700 yards for the 95.

Coal is loaded only one 7-hour shift per day, and 350 tons is average output per shift. The coal is trucked to No. 15 Colliery of the Glen Alden Coal Company.

Sauerman LONG RANGE MACHINES

ABOVE: Gravel is dragged out of river up to screening plant by ¾ yd. SAUERMAN Scraper at rate of 50 cu. yds. per hour.

10 to 1000 cu. yds. per hour —in dry ground or under water

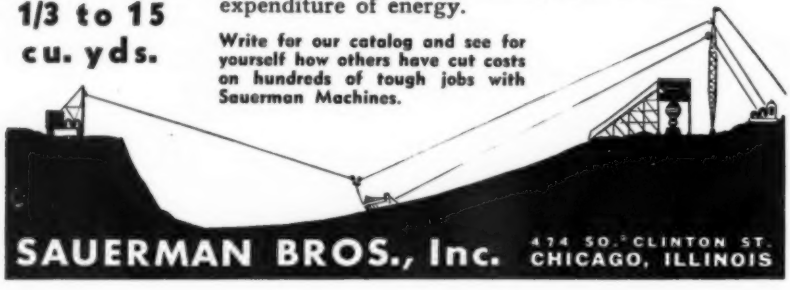
You can cut costs and increase your profit on long range materials-handling jobs if you'll install a SAUERMAN Power Drag Scraper or Cableway Excavator.

These machines are unequalled for moving sand, gravel, blasted rock, clay, loose ore, etc., anywhere up to 1500 ft., can be depended upon to deliver a specified hourly yardage to any point along the line of haul at lower cost than any comparable equipment.

Too, the operation of a SAUERMAN Machine is easy work as the one-man operator directs the machine from a single, stationary point, permitting maximum efficiency with minimum expenditure of energy.

BUCKETS 1/3 to 15 cu. yds.

Write for our catalog and see for yourself how others have cut costs on hundreds of tough jobs with Sauerman Machines.



SAUERMAN BROS., Inc. 474 SO. CLINTON ST. CHICAGO, ILLINOIS

For your convenience in writing to Sauerman Bros., Inc., you will find a card bound in this issue.

Correct Lubrication

NEW LUBRICANTS ahead of new
ds . . . developed in close coopera-
with machine builders by famous
ony-Vacuum laboratories.

HALF A MILLION CASE HISTORIES to
le our engineers in recommending
right use of these lubricants to earn
rication Profits for you.

DISTRIBUTION throughout the world of high-quality lubricants.

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SOCONY-VACUUM OIL CO., INC.
Standard Oil of New York Division • White Star Division • Lubrite Division • Chicago Division • White Eagle Division • Wadhams Division • Magnolia Petroleum Company • General Petroleum Corporation of California

GARGOYLE
Lubricants

For your convenience in writing to Socony-Vacuum Oil Co., Inc., you will find a card bound in this issue.

Dam With a Hollywood Address

(Continued from page 511)

the upstream face and a 4 on 1 slope on the downstream face. The crest width is 30 feet. Rock toe protection, composed of quarry run stone of the 1,000 pound class, is provided on both toes.

The embankment material is being dug from necessary excavations in the outlet structure and spillway, and is augmented by some 1,630,000 cubic yards of borrow pit material dug from the borrow area adjacent to the dam in the retarding basin upstream.

A Koehring 801 dragline was used at first to excavate a small section of the outlet structure. The excavated material was loaded into four 7-yard White trucks and hauled to the fill. This dragline was needed elsewhere on the job, however, and the remainder of the outlet structure was dug by a Bucyrus-Erie 55-B dragline, swinging a 3-yard Essco bucket and casting 2,600 cubic yards of excavated material per eight hours worked.

A fleet of six D8 Caterpillar tractors with LeTourneau 6, 10 and one 30-cubic yard scraper was used to strip the borrow area and to haul occasional loads to the fill. The average haul from the borrow area is 2,200 feet, however, and consequently more speed was needed on the long hauls.

Eight Euclid wagons, hauling 13 cubic yards of solid bank yardage per load and powered with 150-horsepower Cummins diesel engines in the Trak-Truks were used to haul from the borrow pit. These wagons, rambling over the job roads at speeds up to 20 miles per hour, made a round trip in 10 minutes. This consisted of loading, hauling, and dumping the material on the fill. The wagons averaged six loads per hour, and the fleet of eight wagons poured 5,000 cubic yards of pay dirt into the fill per 8-hour shift.

The Euclids were loaded by a No. 48 Caterpillar elevating grader, using a 48-inch conveyor belt and drawn by a D8 tractor. Loading material with an elevating grader is a comparatively new practice in this section of the country.

The dump gates of the Euclid wagons were set to open 21 inches, and a full load was dumped at a rapid pace over 73 feet of fill. This was calculated to meet the six inch lift specified, and was also calculated to do away with the necessity of having a bulldozer handy to knock down the piles. It was found that by dumping in this manner the windrows could then easily be smoothed out with the No. 12 Caterpillar auto patrol kept on the fill.

As soon as the dirt was smoothed out to grade by the auto patrol, the necessary moisture was applied by one of the three water

"IT DIGS AND FILLS BETTER IN SHALE AND ROCK THAN ANY BUCKET I HAVE EVER USED"

● This statement came from a crane operator who for 25 years has worked with all types of buckets. The bucket which won his praise is a ¾ yard Multiple Rope Williams Bucket used by F. F. Mengel Company, Wisconsin Rapids.

The men at the controls know how Williams Buckets can help make time in digging and moving yardage. The men in the "front office" know how Williams Buckets stack up in long service and low maintenance cost.

They're "Built to Last, and Move Dirt Fast"

THE WELLMAN ENGINEERING CO., 7002 Central Ave., Cleveland, Ohio

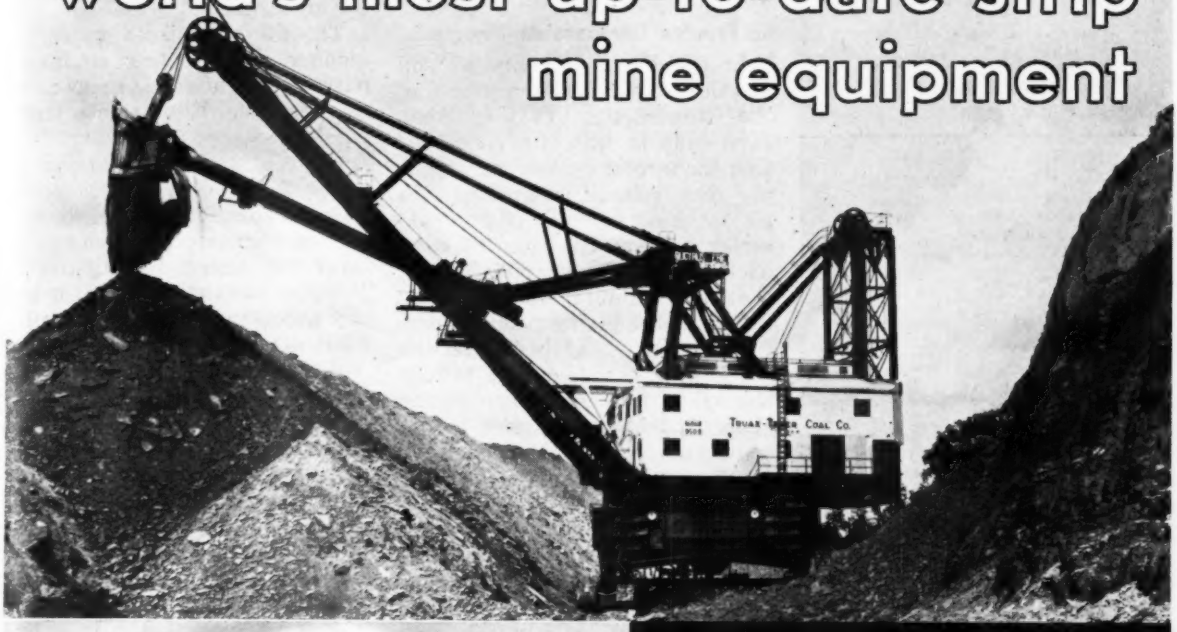
Bulletins describing all types of Williams Buckets sent free on request

Now . . . WELDED Rolled Steel Construction

WILLIAMS *Buckets* built by WELLMAN

For your convenience in writing to The Wellman Engineering Co., you will find a card bound in this issue.

Modernize your pit with the world's most up-to-date strip mine equipment



Over a hundred experienced engineers work the year 'round through good times and bad, keeping Bucyrus-Erie designs up-to-date. They utilize all the information constantly flowing into an organization such as ours — on-the-job information from our sales-engineers, analyses of parts orders, copies of correspondence, the suggestions and comments coal-men send in from all over the world. These designing engineers visit your operations and talk with you, your master mechanic and your operators, they apply the mechanical improvements and developments accumulated from other digging industries, from quarry, metal-mine, contractor, brick and clay, logger, dredger, railroad and industrial plant.

Thus each machine is improved over those that have gone before — perhaps only a small part here or there — but each represents the best engineering in the field — the most complete and up-to-date knowledge of the coal industry.

Bucyrus·Erie

SOUTH MILWAUKEE, WISCONSIN

For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

● Above: A Euclid wagonload of material is brought to the fill area, where (Below) it is leveled out and prepared for water mixing by a Caterpillar autopatrol.

● Above: After sprinkling the fill with this water wagon, a harrow toothed scarifier (Below) mixes the fill, preparing it for the sheepsfoot roller.

trucks on the job. These trucks were fitted with 17-foot bar sprinklers with pump pressure, and after a bit of experimenting the exact amount of moisture needed to compact an optimum fill was applied.

Proctor Compaction Theory

In the Proctor theory of soil mechanics, which is being used in the construction of Sepulveda Dam embankment, it is concluded that the utmost density, or weight per given volume, is obtained with an optimum or "just right" water content at the time of compaction. Insufficient moisture at that time results in voids between soil particles, giving poor compaction. An excess of water, on the other hand, tends not only to bulk the soil with resultant percolation channels but brings grief to the contractor by bogging down fill equipment. According to the Proctor theory, the optimum water content tends to so lubricate the soil particles that they knead readily into place, with the fine particles fitting closely into the voids between coarser ones, resulting therefore in the maximum amount of soil particles per given volume. A fill thus compacted weighs more, contains fewer percolation channels for seep water, and is stronger by far when saturated later with the waters impounded in the reservoir than a fill which is placed either too dry or too wet at the time of compaction. About 20 per cent of water by weight was the optimum content for Sepulveda soils.

It was found best for most purposes to add two or three trips with the water trucks. A harrow-toothed scarifier was run through the six-inch layer of loose soil after each trip of the water wagon to mix the water content uniformly into the soil. This was comparatively simple at Sepulveda owing to the naturally porous and somewhat damp soil characteristics at the borrow pit.

As soon as the moisture content was uniform, a sheepsfoot roller weighing 2,200 pounds per linear foot of tread was drawn across the fill for eight complete coverages by a Caterpillar D8 tractor. The 4-drum Kay-Brunner roller, ballasted with water and saturated sand was quite heavy, and it was necessary for the cat skinner to go to fourth gear to pull the roller. This arrangement tied in nicely with the maximum speed of 2½ miles per hour specified by the Government.

The fill was placed in such a manner that hauling equipment passed over the rolled areas as far as possible. Equipment tracks which appeared in amounts great enough to reduce the bond between the fill and the succeeding layer were scratched lightly with the scarifier before the succeeding layer was placed. During the hot summer months it was also usually necessary to water the rolled fill in advance of each lift.

Although the soil in the Sepulveda region is light, the fill thus placed weighed 130 pounds per cubic foot in place, including the moisture necessary to compact it. This figure exceeded somewhat the estimates of several old-time fill men who did not believe it possible to compact material so tightly.

Just as soon as the long bulk of fill is completed, a highway will be built over the top of the crest of the dam, affording an excellent view of the surrounding country and the reservoir area for passing motorists. There have also been some attempts made to obtain permission from the United States for the construction of a recreation park in the reservoir area. It seems doubtful whether the park project will ever come to pass, however, owing to the yearly danger of retarded water in the reservoir and to the unpleasant cleanup of mud which will be deposited in the reservoir area from suspension after each storm.

Four permanent openings are being built into the outlet structure, and water storage is impossible. The major purpose of the dam is to reduce a 65,000 c.f.s. flood to 6,500 c.f.s. during periods of heavy rain.

Foundation Piledriving Operations

Midway in the dam, about 1,000 feet above Sepulveda Boulevard, and resting on bearing piles is the massive spillway and outlet structure. Soil with certain character-

● Forty-five-foot sheet piles are swung into place by a P&H crane.

istics including that of being nearly 300 feet deep made bearing piles necessary. The type and final design of these piles was worked out after exhaustive tests.

Finally 12-inch x 12-inch H-beams, weighing 53 pounds per linear foot, were selected for bearing piles. Z-type sheeting, weighing 32 pounds per linear foot, was picked for the cutoff structures at the head of the ogee section, the lower end of the spillway and downstream along the outlet works walls. A total of 4,600 piles were drawn into the plans, posing one of the largest piledriving jobs seen in southern California in recent years. These piles, in lengths from 25 to 60 feet, were furnished by the Columbia Steel Company.

A subcontract was let to the Tavares Construction Company of Los Angeles for driving the piles. Two all-steel piledrivers were designed especially for this kind of work by Carl Tavares, the enterprising president of the company. Long before the piledriving job was completed Tavares' piledrivers aroused favorable comment from visiting contractors and engineering executives.

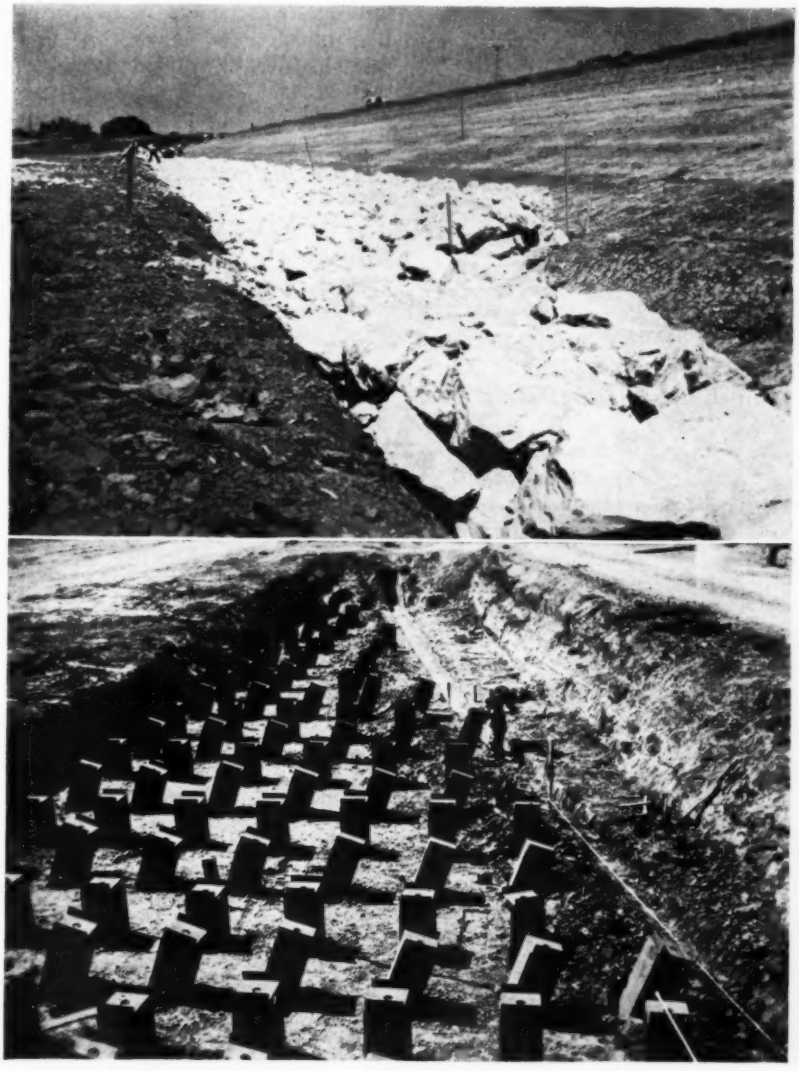
Identical in design, the rigs were built by the Consolidated Steel Corporation of Los Angeles on extra heavy steel frames designed to preclude the possibility of top-heaviness of the 90-foot leads. A 90-horsepower upright boiler was mounted well toward the stern of each driver, supplying steam for the pile hammer and hoisting engine. A 3-drum American hoist was used. Mounted directly in front of the American hoist was a small Clyde bull-engine, used to move the base of the leads to and fro in the process of driving batter piles.

In an effort to learn exactly what type of pile hammer was best suited to the work in general, a new open type Super Vulcan 50C, a McKiernan-Terry 11B3, 9B2, and 7B2, and a ponderous Vulcan O hammer were used. These hammers ran the gamut of punishment and finally the job routine settled down to the use of the Vulcan O and the McKiernan-Terry 11B3 hammers on bearing piles, with the 9B2 and 10B2 hammers used on sheeting.

Christen New Piledrivers

As soon as each of the new piledrivers was assembled on the job, they were christened in turn by Mrs. Carl Tavares and by the wife of Tavares' superintendent, Mrs. Bill Pace. The ceremonies were informally attended by the majority of the piledriver men on the job, who grinned happily for the photographer and smacked their parched lips in anguish when the champagne smashed against the driver bows.

Named the "Lexington" and "Saratoga" the drivers were rigged to allow comparatively easy maneuverability. Underneath



● Top: Heavy rock riprap protection is placed at both toes of Sepulveda Dam. Bottom: View of vertical and batter piles showing protection caps welded in place.

● A P&H crane lays pipe in the trench that has just been dug by the Buckeye trench excavator in the background.

the huge I-beams which form the base of each rig was fastened a 3-inch hardwood timber of apaton. Apaton is one of the two species of hard Philippine tropical woods known as Philippine mahogany. The other, known as begac, is equally hard but does not come in the large size needed.

These heavy hardwood shoes rested on 12-inch x 12-inch spruce cribbing. Bolted to the top of each sill with countersunk bolts was fastened a running plank of 2-inch x 6-inch apaton, greased with ordinary way grease. The heavy 61-ton piledrivers moved about on these skids with ease, with only a few turns of a 1¼-inch rope on a winch necessary to pull them over. Four part blocks were used at the fore and aft ends of the port and starboard sides of the machines. Forward and backward motion was accomplished in much the same manner except that the blocks were fastened with a clamp to the timber cribs upon which the driver rested.

Setting 60-foot Carnegie Z-type sheeting, these rigs accounted for as high as 55 pieces set to 15 feet of penetration, and in straight driving they were good for 800 to 1,000 linear feet per 8-hour shift. Beyond the mark of 40-foot penetration the piles tightened up and went down hard.

Driving Carnegie H-beams, these rigs went up to 2,000 linear feet in 8 hours, averaging over the course of the job 1,000 linear feet per shift. A time increase of only 6% was necessary over vertical piles on the 1 on 3 battered piles because the batter arrangement of the leads was so efficient. Not once in the course of the entire job was it necessary to extract a pile because of veering batter.

A Type 52 P&H crane was used with a swinging set of leads and a 9B2 pile hammer to drive a little more than half of the sheeting.

Placing 70,000 Yards of Concrete

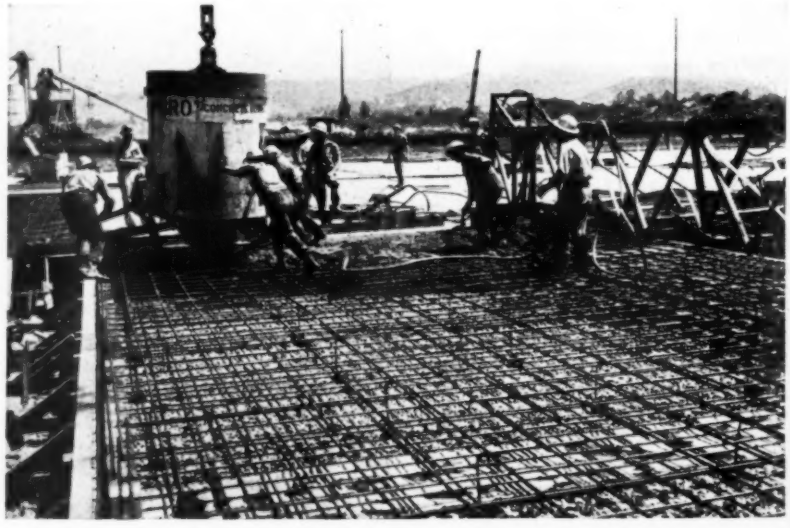
Some 70,000 cubic yards of concrete, going into the spillway and outlet structures, are being handled by a Koehring 801 dragline and the Bucyrus-Erie 55-B machine. The concrete is batched and mixed at the job plant 1,000 feet from pouring operations, dumped into 3-yard Gar-Bro buckets and hauled to the job in four Ford trucks. Placed concrete is vibrated with six Chicago Pneumatic vibrators which work it well into the 7,500,000 pounds of deformed reinforcing steel. Steel is furnished by the Blue Diamond Company of Los Angeles. Aggregate is furnished by the Consolidated Rock Company of Los Angeles, and bulk cement is furnished by the United States.

The Class A concrete, designed for a 28-day strength of 3,400 pounds, is mixed in 2.2 cubic yard batches from this basic mix which yields 1 cubic yard of concrete per 5.25 sacks of cement:

Sand	240 pounds
¼" to ¾" aggregate	180 pounds
¾" to 1½" aggregate	210 pounds
Cement	94 pounds
Water	5.5 gallons

Charles Clapp is the contractor's superintendent on the job, Lieut. Col. Edwin C. Kelton is the Los Angeles district engineer, and George Carey is the principal engineer in charge of the dam for the Government.

● Concrete for the spillway structure is poured on a bed of reinforcing steel from a 2½-yard Gar-Bro bucket.



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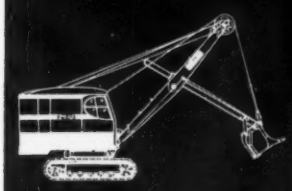
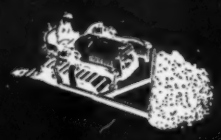

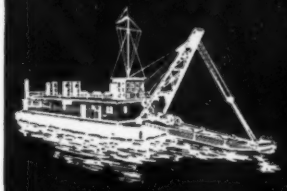

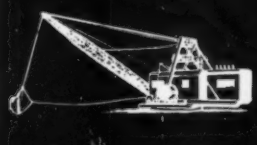
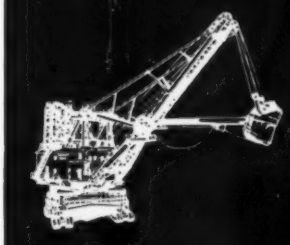
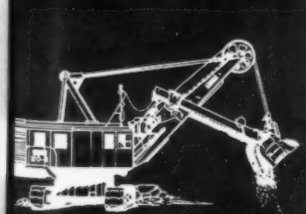
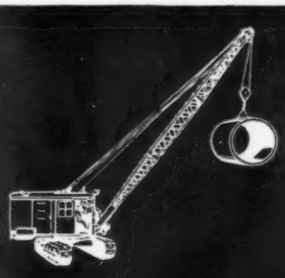
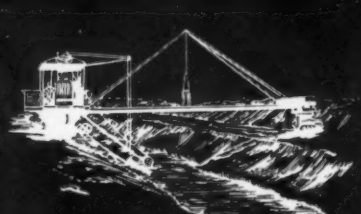
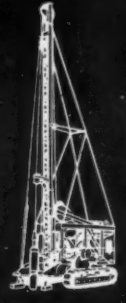

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